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SARANAC LAKE AND THE SARANAC LABORATORY FOR THE STUDY OF TUBERCULOSIS

by EDWARD R. BALDWIN, M.D.[1]

WHEN in 1873 Dr. Edward Livingston Trudeau began a quest for personal health by taking up residence in a little community known as Saranac Lake, in the Adirondack Mountains of New York State, Pasteur had just completed his first work on the causes of fermentation, which resulted in the revolution of surgical practice. The inspiration of America's great movement for the conquest of tuberculosis began a decade later, in 1884, when Trudeau established at Saranac Lake the first semipublic institution in the United States for the treatment of tuberculous patients, the Adirondack Cottage Sanitarium, subsequently named the Trudeau Sanatorium.

During the intervening half-century, the obscure village that was the birthplace of this movement was closely identified with the many facilities for the study and treatment of tuberculosis which grew out of this institution. Indeed, the name of Saranac became synonymous with that of Trudeau. Other places in the West and South were renowned for climatic advantage; not so, at that time, the Adirondacks. All the more significant, therefore, was the message that cures were possible in the cold of the Saranac winter and during the more or less rainy summer. It was the personality of Trudeau that brought confidence to patients and physicians alike and made the village of Saranac Lake a resort for a private clientèle, while the sanatorium built on a nearby hill gave the same advantages to those of little means.

Today numerous facilities exist in Saranac Lake for private and institutional care of the tuberculous. Grouped about the

[1]Dr. Baldwin is director of the Edward L. Trudeau Foundation.

hills of the village and its environs are adequate accommodations for private treatment at home or *en pension* as in the Swiss resorts. The scope of this medical center is not confined to the local requirements of New York State, but serves the country at large east of the Mississippi. Because of its adjacent location, Canada also receives a goodly share of its influence.

The growth of the village was slow until Trudeau and his sanatorium brought reputation to it. It was accelerated by the establishment in 1893 of the Saranac Laboratory, the first in the United States devoted to original researches in tuberculosis. The patients were hopeful that through laboratory research a cure for tuberculosis might be discovered. The first laboratory equipment had been set up in the Trudeau homestead, and in 1890 Trudeau was already doing experiments in his office with an enthusiasm that surpassed his knowledge. When a fire destroyed his house in 1893, there came the opportunity to build a modern laboratory, fireproof and durable, as Osler predicted. It was the late George C. Cooper of New York who "did the Phoenix trick," and provided funds for the building that is located in the village of Saranac Lake. In 1923 another building was erected on the grounds of the sanatorium to provide quarters for the Research and Clinical Laboratory, where there are ample facilities not only for routine examinations required for sanatorium patients, but for scientific research in the fields of bacteriology, chemistry, and treatment of tuberculosis. The original Saranac Laboratory, referred to later, was continued with the aid of the Milbank Memorial Fund and other gifts. It provides diagnostic facilities to the patients outside the Trudeau Sanatorium, and opportunities for research and teaching. The combined library and lecture room is the center of medical interest in the village.

Coincident with the growth of the sanatorium in the nineties came a number of young medical men who, while under treatment, engaged in some medical activities. They also took up their residence in the village and became tuberculosis doctors, following the lead of Trudeau. The cohesion was strong among the Trudeau group, and gave rise to a spirit widely recognized as unique among health resort physicians.

Meanwhile the movement for establishing tuberculosis institutions spread over the country, bringing a demand for physicians with training. Just before the death of Dr. Trudeau in 1915, the postgraduate course known as the Trudeau School of Tuberculosis was founded by the late Samuel Mather, whose interest was enlisted by Dr. Robert H. Bishop, his son-in-law. An annual stipend of $5,000 was contributed by Mr. Mather for the first eleven years. Thus far seventeen sessions have been held with an average annual attendance of twenty-five physicians. Over 375 doctors have taken the course. Scholarships covering tuition are provided for about six students each year. Practically all the tuberculosis physicians and surgeons in Saranac Lake take part in the teaching by clinics at the hospitals and sanatoria. There are over 800 beds in these institutions, which include, besides Trudeau, the New York State Hospital at Ray Brook, Stony Wold and Gabriels sanatoria, the Reception Hospital, and the Saranac Lake General Hospital. All are within easy reach and are well equipped with X-ray and other laboratories for clinical study and for surgical treatment, now an important adjunct. The Saranac Laboratory remains the headquarters for the school.

The death of the leader came before there was any assurance of permanency for the research and teaching then in progress. It was then that the sanatorium trustees decided to establish a memorial endowment fund to maintain these activ-

ities. Created by gifts from Dr. Trudeau's friends, this fund was called the Edward L. Trudeau Foundation. The endowment now amounts to $550,000, of which $93,000 is specifically for the support of the Saranac Laboratory. Besides the Trudeau School and the Research and Clinical Laboratory, the Foundation supports a medical library, a statistical department, and fellowships. Through this fund and annual donations the institution at present gives employment to twenty-six full or part-time ex-patients, an unique service in the history of sanatorium operation. The stated objects of the Foundation are:

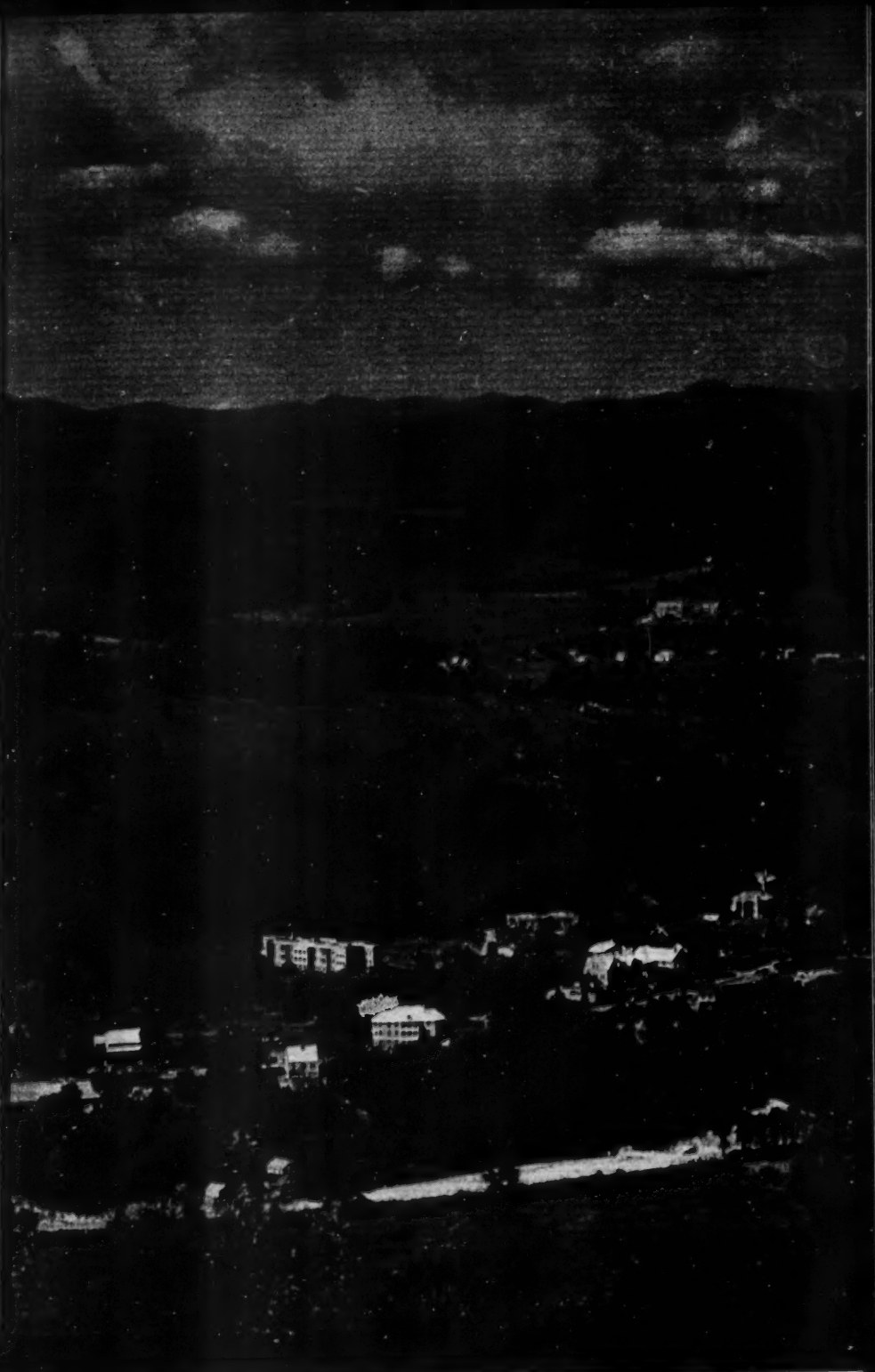
1. To maintain laboratories and carry on research into the causes and treatment of tuberculosis.

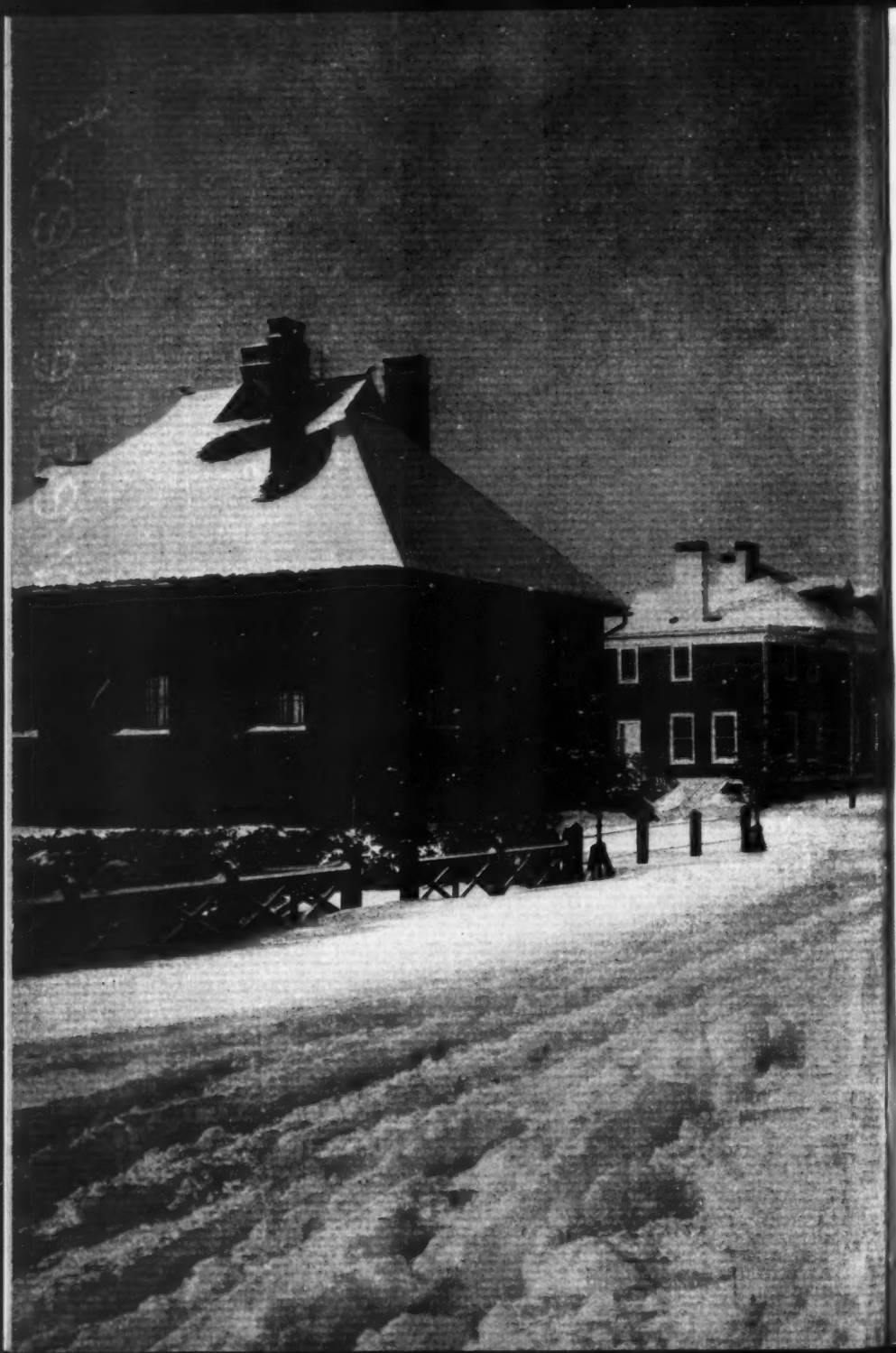
2. To maintain regular courses of instruction for physicians and others in the most advanced knowledge of tuberculosis, under the name of the Trudeau School of Tuberculosis.

3. To offer young physicians and others the opportunities for research work while undergoing treatment for tuberculosis, through the establishment of fellowships.

The administration of the fund is the duty of the sanatorium trustees, aided by a council of well-known advisors: Dr. William H. Welch, professor emeritus of the history of medicine at the Johns Hopkins School of Medicine; Dr. William H. Park, director of Research Laboratories of the New York City Department of Health; Dr. Theobald Smith, Department of Animal Pathology of the Rockefeller Institute; Professor Thomas McCrae of Jefferson Medical College; and Professor Hans Zinsser of Harvard University. The annual report containing published studies is issued in conjunction with the Trudeau Sanatorium medical report.

The separate organization of the Saranac Laboratory was made necessary by the terms of the legacy of Dr. Trudeau and by the addition of the John Black Room, a lecture room





and library for physicians and students. Mr. and Mrs. Frank B. Black of Mansfield, Ohio, and the Milbank Memorial Fund each pledged $100,000 as a special endowment for the laboratory, which assures the maintenance of the research work on a small scale.

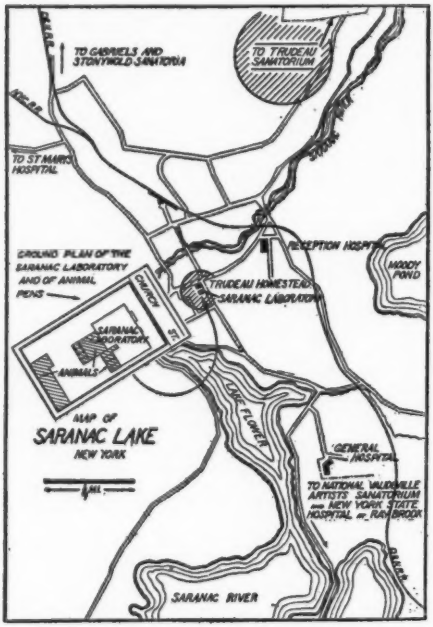
Other donations, including gifts by local physicians organized in a group known as the Saranac Lake Academy of Medicine, enable the Saranac Laboratory to maintain a full-time staff. The Metropolitan Life Insurance Company, the United States Public Health Service, the Chemical Foundation, and former patients, aided by an appropriation from the Trudeau Foundation, are supporting a program of experimentation for the prevention of tuberculosis in industry, especially in the dusty trades. The support for this important research is inadequate, and an additional endowment of $300,000 is being sought to carry on the work.

The part played by the Saranac Laboratory in advancing the knowledge of tuberculosis has been a matter of common knowledge to physicians for many years. It may be less well-known by workers in the public health field outside of tuberculosis.

The early efforts of Dr. Trudeau to carry on laboratory investigations in tuberculosis are graphically described in his "Autobiography." The difficulties were many, and much ground work had to be done before practical results could be seen. He began with primitive apparatus, but aided by a microscope he was able to see the tubercle bacilli, and to isolate and grow them in a home-made culture oven. Immediately afterwards he inoculated animals, which were then treated with germicides like creosote, hydrofluoric acid, and hot air, to learn whether the disease could be aborted or cured.

The methods of Pasteur by which rabies, chicken cholera,

and anthrax had been conquered by vaccination with weakened virus, appealed to Trudeau's imagination. In the early nineties we find him experimenting with tubercle bacilli of low virulence, with the purpose of protecting animals from disease-producing bacilli. In fact his work was simultaneous with that of Koch, who in 1890 brought out tuberculin, which, however, failed to be the hoped-for preventive and curative specific.



After the gift of new buildings in 1893 by Mr. Cooper, a new impetus was given to continuous work.

At that time Mrs. Elizabeth Milbank Anderson, founder of the Milbank Memorial Fund, began her support of the pioneer work on experimental immunity stimulated by the discovery of tuberculin in 1890.[2] It was likely that she was quite as much persuaded to lend her aid because of the practical support it offered to young physicians suffering from tuberculosis as by the ardent enthusiasm of Dr. Trudeau for science in the wilderness. It is doubtful whether she expected

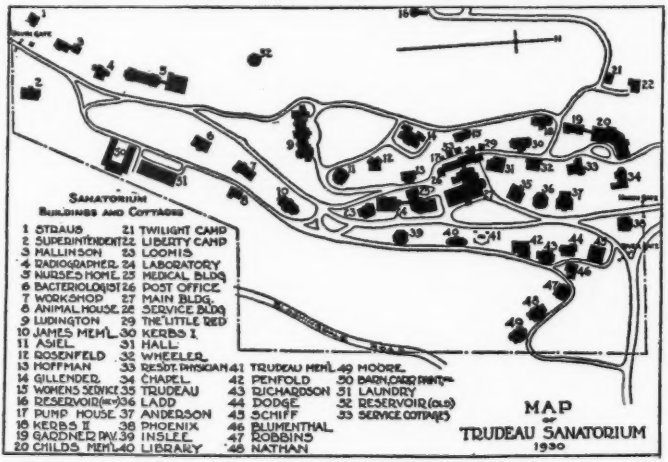
[2] Mrs. Anderson also gave the funds for the erection of Anderson Cottage, shown as building number 37 in the map on page 9.

any tangible results other than the benefit derived by the workers themselves.

In discussing the hope of discovering a cure, she once stated that she was more interested in the benefit to young men disabled and yet with ability to keep up a degree of interesting study and experimental research while recovering their health. It is to be kept in mind that all the investigations undertaken under Dr. Trudeau's direction were done by convalescent tuberculous patients. In spite of the physical limitations of these workers, the results obtained exerted a powerful influence on the practice of medicine and the development of sanatorium treatment. Reference to those deemed most important may be allowable.

The knowledge of immunity to disease was in its infancy. Serums had been discovered for diphtheria and tetanus, but as yet little was known about the principles governing their use. Many serum cures were promoted for tuberculosis, but awaited proof of their activity.

In the decade from 1890 to 1900 the problems of tubercu-



lin, its nature, the chemistry of the tubercle bacillus and supposedly antitoxic serums were given much study. The fact that no specific serum was found to counteract tuberculosis saved many from expensive and dangerous treatment.

The absence of a true toxin or poison in the bacillus was clearly demonstrated during the next decade by the chemist, Dr. P. A. Levene, now chief of the chemical division of the Rockefeller Institute, but for several years a worker in the Saranac Laboratory.

The special studies on tuberculin and hypersensitiveness made in the period between 1910 and 1920 by various workers, notably Dr. Allen K. Krause, were the means of explaining many obscure problems. A fuller understanding of the symptoms of tuberculosis was for the first time made possible by these experiments. How tuberculosis is resisted in the body is also becoming better known as the result of these experiments in immunity. Much of this spade work has been tedious and required years of effort.

Simultaneously with the study of immunity begun by Trudeau himself, the dangers of infection from room dust, clothing, table utensils, et cetera, were examined. Disinfectants and methods of fumigation of rooms were investigated, resulting in practical rules for institutions and patients.

It is not possible to relate here details of other contributions to the treatment and the tests of alleged cures that have been vaunted for tuberculosis. The Saranac Laboratory was founded for such practical objects as were intimately connected with the cause, prevention, and treatment of tuberculosis. Hence at various times it has carried out experimental investigations on animals of the creosote cure; the peppermint inhalation cure; the effects of gold and soda, copper, cinnamon acid, and carbolic acid; and of a score of tuberculins and gland extracts. These were being promoted by enthu-

siasts, or for commercial gain, and usually without proof of usefulness or harmlessness.

For the past ten or twelve years the Saranac Laboratory has been carrying on an intensive study of industrial tuberculosis, with special reference to its manifestations in dusty trades. This field has recently become recognized as the most important source of tuberculosis cases. At the 1931 annual meeting of the American Public Health Association, Dr. Louis I. Dublin stated that among industrial policyholders of the Metropolitan Life Insurance Company the tuberculosis rate was over 83 per 100,000; among those able to afford a policy of $5,000 or more, the rate was only 17 per 100,000; while in the intermediate group it was 48. He said that the high rate in the industrial group was almost wholly due to the hazard of inhaled silica or quartz dust. He emphasized the necessity of concentrating the attack upon the remaining strongholds of tuberculosis, now that the general rate is so consistently falling. This elimination of the major portion of industrial tuberculosis is theoretically easy; remove silica dust from the atmosphere of mines, quarries, and factories, and the incidence of tuberculosis will unquestionably fall. In practice, however, it is not easy or economically possible to remove such dust below dangerous limits in some of the industries. Experiment must demonstrate whether the dangerous effects of silica cannot be neutralized.

The Saranac Laboratory has supplied the method of attack. It has carried on systematic investigations of a series of industrial dusts which have indicated their possibilities for harming the lungs and creating susceptibility to tuberculosis. It has for the first time demonstrated the possibility of producing in animals the chronic disease of the lungs resulting from long-continued inhalation of quartz dust, known as silicosis. It has shown that dusts other than pure quartz when

inhaled for a very long time do not predispose to tuberculosis.

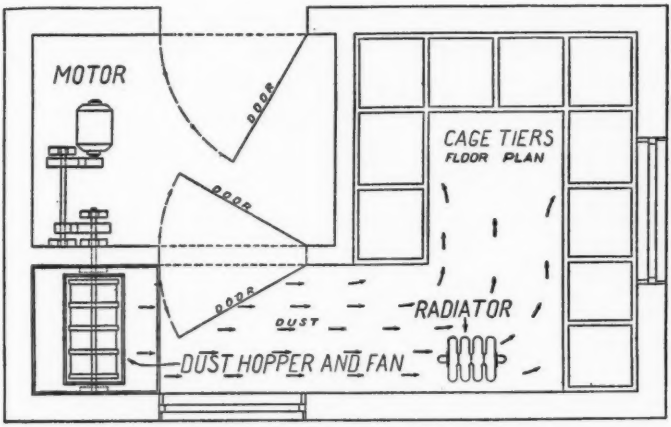
It is now engaged in a study of methods designed to neutralize these dangerous properties of quartz dust. The laboratory has also carried on a clinical study among quartz miners which has demonstrated that chronic infections other than tuberculosis may complicate silicosis and incapacitate the workers. Some of these infections are amenable to specific treatment. When the complication is eliminated, the worker is able to return to his occupation.

The compilation of exact data on the action of various industrial dusts is of special importance at the present time, because adequate legislation must be provided to control the production of dusts. Suits against manufacturers of quartz and asbestos products, aggregating over $3,000,000, are pending in the courts of America today. In most states they are not referable to the compensation commissions but are being tried as civil suits for damages. For the framing of intelligent compensation laws, clinical, statistical, and experimental investigation of the action of various dusts is imperative.

The years of experience in the study of tuberculosis complicating disease produced by inhaled dust has laid the foundation for productive work in the field of prevention. The staff and equipment of the Saranac Laboratory are organized for this specific purpose, and with adequate financial support this institution is in a position to make valuable contributions. The Milbank Memorial Fund gift toward endowment, with others, is a substantial help at this time.

What is the future of tuberculosis, its prevention and treatment, and what may be the place of Saranac Lake in the completed plans for its control?

The present remarkably successful effort to isolate patients in sanatoria and hospitals is bearing fruit in lessened mortality. Any observer can note the gradual segregation of pa-



Floor plan of equipment for subjecting animals to dusts encountered by workmen in various industrial processes.

tients, with the tendency to restrict their employment when actively diseased. In and about Saranac Lake, sanatoria have sprung up as a result of the special knowledge of medical and nursing care available in the community and the absence of prejudice and fear of the disease. These special advantages have resulted from years of experience in the sanitary control and supervision of rooming and boarding cottages. The possibility of rearing healthy families in private homes in such a community has been demonstrated, and an adequate school inspection has afforded results that are most gratifying.

Situated in an invigorating climate, an area of immense population within a day's journey, this tuberculosis colony has already grown to a population of 8,000. Of this number perhaps 2,000 have been or are patients, among whom are many transient dwellers. Except for the few, idleness is forced upon them whether at home or elsewhere. It would seem, therefore, that as a colony for invalids with no manufacturing industries, Saranac Lake is proving its superior worth.

Its position as a medical center is being made secure, but its educational work for tuberculous patients must be extended to include vocational training and reeducation. The suggestion has already been made to the Trudeau Foundation that it enlarge its objectives to include the teaching of undergraduate college subjects in the arts and sciences. Such a project would require large resources but undoubtedly would find favor, for many young persons who now have to abandon further education after treatment could continue their studies if they were offered under the sheltered conditions of sanatorium supervision. The problem of the tuberculous unemployed awaits solution, for hundreds are physically able under skilled medical supervision to do useful work.

The Trudeau School has found increasing favor with young physicians who desire to complete their hospital training. Little attention is given to tuberculosis in general hospitals and frequently such cases are transferred or excluded when discovered. Hence postgraduate courses under conditions where all the complications of the disease can be studied are likely to be needed indefinitely.

Concerning the goals in view for laboratory research, the Saranac Laboratory has a definite field in the prevention of industrial tuberculosis under the direction of Dr. Leroy U. Gardner, a pathologist of experience.

Nor is this all. The causes which lie back of tuberculosis are yet very obscure in many respects. These must be investigated from the standpoint of chemical, physiological, and clinical aspects, in laboratories and sanatoria. The epidemiology of the disease has thus far been regarded as a field problem in the homes and public places. Epidemiology is now being transferred to the laboratory where suitable control experiments can be made. These studies promise great rewards in the prevention as well as the cure of tuberculosis.

A STUDY OF THE FERTILITY OF NATIVE WHITE WOMEN IN A RURAL AREA OF WESTERN NEW YORK[1]

by EDGAR SYDENSTRICKER

OVER twenty years have passed since the federal government secured information relating directly to a characteristic of the population which, now more than ever, is viewed as important by those who are interested in biological and social changes. This characteristic is the fertility of the population and of its various racial, social, and economic component groups. The declining birth rate, which has manifested itself in so pronounced a degree in recent years, and the effect of a selective restriction of immigration upon our racial stock, are unmistakable evidence that changes are taking place. What the nature of these changes is, in what groups and strata of our population they are most pronounced, what they augur for the future composition of the American people, are matters of utmost concern upon which current data of an indirect kind only are now available.

In the federal censuses of 1900 and 1910 information was collected on duration of marriage and the total number of children born to each married woman. These items, and the facts usually obtained relating to her age at census, the countries of birth of herself and her parents, and those of her husband and his parents, the place of residence, and her own and

[1]From the Division of Research, Milbank Memorial Fund. Acknowledgments are gratefully made to the women of the area studied, without whose cooperation it would have been impossible to make this study; to the members of the field staff of the Office of Statistical Investigations of the United States Public Health Service who assisted the field staff of the Division of Research in collecting the data; and to the Bureau of the Census, Washington, D. C., for use of unpublished records. I would like especially to express my indebtedness to my associate, Miss Dorothy G. Wiehl, who carried the somewhat laborious task of statistical analysis.

husband's occupations, constituted an adequate body of data for drawing rather broad but definite conclusions as to the fertility of various racial, socio-economic, and geographical groups, and the rate of their contributions to the population. A continued series of such cross sections would have yielded valuable indications as to the nature of certain changes in these contributions and, therefore, in the biological and social character of the people. The failure of the federal government to include the two simple items of information referred to above, even for samples of the population, in the censuses of 1920 and 1930, or even to tabulate them for earlier censuses, has forced the student of these important questions to rely upon less definite and direct information, although in a few instances privately aided tabulations have been made of some of the earlier records and later information for relatively small samples has been collected.

The present paper presents some of the results of one attempt to collect the desired data for a completely enumerated population of a single area for 1929-1930. The data now gradually being assembled for other areas will be presented from time to time for a period centering around 1930.

The area under consideration here is a small one, but the data are not without interest both from the points of view of the indications they afford and of the possibilities they suggest for similar inquiries on a larger scale. The area includes five rural townships in Cattaraugus County, in the southwestern section of New York, with a total population of about 5,000. The character of this population has not changed greatly in the past half-century or more. It is composed almost entirely of native white families of the "older native stock." One village of approximately 1,000 people is included, the remainder of the population living on farms or engaging in occupations ordinarily found in a strictly rural

community. It is only thirty to sixty-five miles distant from Buffalo, but it is not greatly affected by urban conditions, and is in no sense suburban. Indeed parts of the area are still rather isolated. As in other rural communities, signs of change are evident in improved roads, in the introduction of telephones, automobiles, and radios, and in a shift from general to specialized (dairy) farming. In short the area is probably fairly typical of many rural districts in this section of the country.

The data were collected in the autumn of 1929 and the winter of 1929-1930 and included, in addition to the items already indicated, the birth date of each child and the marriage date of each woman. Practically every family within the area was included since the same area was used for studies of the incidence and prevalence of ill health, of the epidemiology of certain diseases, of sanitary conditions, and of the extent to which the population received medical and other health services.

For the purposes of this particular study a selection was made of 1,036 records which included all of the native-born women living at the time of the enumeration, who had been married only once and had not been permanently separated from their husbands prior to their forty-fifth birthdays.

FERTILITY AS RECORDED IN 1929-1930

To these 1,036 women there had been born, up to the time they had been visited by the enumerators, 2,959 live children, the average number of children per wife being 2.86. This average, however, includes families just started as well as entirely complete families and does not take into account the fact that a large proportion of the women are still in the childbearing age, and thus is not a true measure of their fertility. In Table 1 the birth rates are given for women of

Age of Wife	Number of Wives	Number of Live Births	Births per 100 Wives
Total	*1,036*	*2,959*	*286*
Under 25	110	114	104
25–29	111	263	237
30–34	105	290	276
35–39	122	347	284
40–44	119	423	355
45–54	206	634	308
55–64	155	516	333
65 and over	108	372	344

Table 1. Cumulative birth rates for native-born married women of specific ages living in rural Cattaraugus County, in 1929–1930.

different ages. It will be seen that for women under 25 years of age the birth rate was 104 per 100, or about one child per woman, and that the rate rises rapidly to 237 per 100 women in the age period 25-29, 276 per 100 in the age period 30-34, 320 at 35-44. For women over 45 the rates are all in excess of 300, or over three children per woman, the average for this group being 3.31. This figure represents more accurately the total fertility of women in our sample area since it tells us how many live children were produced by the average wife who had lived with her husband at least until the end of her childbearing period.

It has been computed by Dublin and Lotka[2] that in order to prevent a decrease in the population an average of 3.06 children must be born to each woman who marries. The average of 3.31 children born alive per wife whose marriage remained unbroken until the end of the childbearing period is, therefore, not excessive, although it is probably sufficient to maintain the size of a relatively healthy rural population.

[2]Dublin, Louis I., and Lotka, Alfred J.: On the True Rate of Natural Increase. *Journal of the American Statistical Association*, September, 1929, xx, New Series, No. 150, pp. 305 and 339.

Yet it is interesting to note in Table 2, that over a fourth (28.5 per cent) of the women in our sample 45 years of age and over had borne either no children at all or only one child.

Table 2. Size of families of native-born married women aged 45–64 years living in rural Cattaraugus County in 1929–1930.

Number of Children Born Alive	Number of Wives Reporting Specified Births	Per Cent of Total Wives
Total	*361*	*100.0*
0–1	103	28.5
2–3	123	34.1
4–5	75	20.8
6–	60	16.6

This great variation in the fertility of women is due to many causes, physiological and other, of which we as yet know little. It has been clearly shown, however, in several extensive studies, that there is an association between human fertility and socio-economic condition, and it has been found that the fertility of white women of native stock under rural conditions is higher than in any social or occupational class in an urban environment. Is this greater fertility a concomitant of rural life *per se*? Or is social status, with its occupational, educational, and other implications, also a factor?

DIFFERENTIAL FERTILITY RATES, 1929-1930

One way in which to throw light upon these questions is to ascertain the fertility rates of women in different occupational classes living under the same environment. Although the total number of women in our rural sample is not large, it is possible to divide them into three groups, roughly differentiated from the point of view of socio-economic or occupational status, namely, wives of farmers, laborers, and business men. Of the farm group, four-fifths were wives of farm owners, one-sixth of renters, and an insignificant num-

Age of Wife	Births per 100 Wives			Number of Wives			Number of Live Births		
	Farm	Labor	Business	Farm	Labor	Business	Farm	Labor	Business
Total	*323*	*237*	*230*	*598*	*283*	*155*	*1,932*	*671*	*356*
Under 25	124	96	44	46	55	9	57	53	4
25–34	277	248	185	118	71	27	327	176	50
35–44	362	286	229	137	63	41	496	180	94
45–54	340	287	167	135	47	24	459	135	40
55 and over	366	270	311	162	47	54	593	127	168
Standardized rate[1]	299	246	189						

[1]Standardized by applying the age distribution of an urban and rural sample of 99,226 native-born married women drawn from the 1910 census sheets.

Table 3. Cumulative birth rates for native-born married women of specific ages in different occupational classes living in rural Cattaraugus County in 1929–1930.

ber wives of farm laborers. The labor group was composed of wives of men who were not farm laborers but employees in small factories and in various occupations both in the country and in the village. The business group was composed of wives of men who were engaged in various businesses in the village, and in the country stores and other establishments, and in professional and clerical occupations. The fertility rates for women in these three classes are presented in Table 3. The age distribution of the wives was found to differ, that in the labor group being somewhat younger and that in the farm and the business groups being somewhat older. It is necessary, therefore, to standardize the birth rates for age.[3] When this is done, a very interesting fact appears. It is that

[3]Rates have been standardized by applying the age distribution of 99,226 wives in urban and rural sample populations drawn from the 1910 census enumeration sheets. *See* Sydenstricker, Edgar, and Notestein, Frank W.: Differential Fertility According to Social Class. *Journal of the American Statistical Association*, March, 1930, xxv, New Series, No. 169, pp. 9–32.

even *within* a rural community differences in fertility rates are found which are associated with differences in occupational status. Thus the highest birth rate (299 per 100 wives) was found for the farm group; and the lowest (189) characterized the business group, while the labor group (246) fell between the two. The differences between the rates for the business and the labor groups in this rural area are of the same general nature as that found between business and labor groups in urban communities, and the fertility of wives living on farms is the highest of all. While the size of our sample is small, the differences are consistent with age of wife, and they suggest an observation that is not without significance, namely, that although rural environment *per se* may be a factor in the rate of human fertility, the conditions associated with occupation probably are factors operating independently of general environment. The relative importance of these two factors cannot be determined definitely until more data are accumulated and comparable information as of 1930 is available for urban occupational groups.

The differential fertility rates according to occupational groups persist in each of three age periods even when "exposure to risk" is controlled by excluding late marriages and taking the length of marriage into account, and when stillbirths as well as live births are included. The somewhat detailed tabulation necessary for this analysis is presented in full in Table 4 in order that the method employed may be clearly understood.[4] The cumulated rates plotted in Figure 1,

[4]The procedure may be summarized briefly as follows: Only women who were married under 25 years of age were included, and within each occupational group as already defined the number of wives who had completed a specific year of marriage was ascertained. The number of live births as well as stillbirths occurring during each year of marriage to these women was then found, and the birth rates computed for specific years of marriage. These birth rates were then cumulated in order to show the total number of births (including of course, both still- and live births) that had occurred during varying dura-

(Continued on page 25)

Completed Years Married	Farm			Labor			Business			Cumulative Rates[1]		
	Number of Wives	Live and Still Births in Each Year		Number of Wives	Live and Still Births in Each Year		Number of Wives	Live and Still Births in Each Year		Farm	Labor	Business
		Number	Rate per 100 Wives		Number	Rate per 100 Wives		Number	Rate per 100 Wives			
Wives Under 30 Years of Age in 1929–1930												
1	99	36	36.4	77	25	32.5	18	4	22.2	36.4	32.5	22.2
2	92	38	41.3	68	25	36.8	16	6	37.5	77.7	69.3	59.7
3	84	25	29.8	56	18	32.1	15	2	13.3	107.5	101.4	73.0
4	78	32	41.0	47	17	36.2	12	4	33.3	148.5	137.6	106.3
5	65	29	44.6	39	9	23.1	11	2	18.2	193.1	160.7	124.5
6	53	13	24.5	33	10	30.3	9	2	22.2	217.6	191.0	146.7
7	41	17	41.5	26	7	26.9	8	2	25.0	259.1	217.9	171.7
Wives 30 to 44 Years of Age in 1929–1930												
1	161	39	24.2	74	17	23.0	35	8	22.9	24.2	23.0	22.9
2	161	63	39.1	74	28	37.8	35	13	37.1	63.3	60.8	60.0
3	161	66	41.0	74	23	31.1	35	11	31.4	104.3	91.9	91.4
4	161	49	30.4	74	20	27.0	35	12	34.3	134.7	118.9	125.7
5	161	49	30.4	74	22	29.7	35	7	20.0	165.1	148.6	145.7
6	161	45	28.0	74	14	18.9	34	6	17.6	193.1	167.5	163.3
7	160	37	23.1	73	18	24.7	34	4	11.8	216.2	192.2	175.1
8	158	40	25.3	72	13	19.4	34	7	20.6	241.5	211.6	195.7
9	156	36	23.1	70	15	21.4	33	4	12.1	264.6	233.0	207.8
10	153	23	15.0	66	9	13.6	31	4	12.9	279.6	246.6	220.7
11	147	27	18.4	62	10	16.1	29	1	3.4	298.0	262.7	224.1
12	138	18	13.0	58	10	17.2	27	2	7.4	311.0	279.9	231.5
13	127	20	15.7	55	7	12.7	26	3	11.5	326.7	292.6	243.0
14	117	18	15.4	52	3	5.8	24	0	0.0	342.1	298.4	243.0
15	108	10	9.3	45	4	8.9	22	2	9.1	351.4	307.3	252.1
Wives 45 to 64 Years of Age in 1929–1930												
1	156	35	22.4	57	14	24.6	41	11	26.8	22.4	24.6	26.8
2	156	59	37.8	57	21	36.8	41	14	34.1	60.2	61.4	60.9
3	156	51	32.7	57	19	33.3	41	10	24.4	92.9	94.7	85.3
4	156	41	26.3	57	20	35.1	41	9	22.0	119.2	129.8	107.3
5	156	46	29.5	57	13	22.8	41	6	14.6	148.7	152.6	121.9
6	156	35	22.4	57	13	22.8	41	8	19.5	171.1	175.4	141.4
7	156	34	21.8	57	13	22.8	41	5	12.2	192.9	198.2	153.6
8	156	36	23.1	57	14	24.6	41	8	19.5	216.0	222.8	173.1
9	156	27	17.3	57	11	19.3	41	4	9.8	233.3	242.1	182.9
10	156	25	16.0	57	6	10.5	41	5	12.2	249.3	252.6	195.1
11	156	32	20.5	57	7	12.3	41	2	4.9	269.8	264.9	200.0
12	156	18	11.5	57	4	7.0	41	1	2.4	281.3	271.9	202.4
13	156	22	14.1	57	6	10.5	41	2	4.9	295.4	282.4	207.3
14	156	20	12.8	57	4	7.0	41	8	19.5	308.2	289.4	226.8
15	156	21	13.5	57	10	17.5	41	5	12.2	321.7	306.9	239.0
16	156	20	12.8	57	1	1.8	41	2	4.9	334.5	308.7	243.9
17	156	14	9.0	57	3	5.3	41	2	4.9	343.5	314.0	248.8
18	156	14	9.0	57	3	5.3	41	1	2.4	352.5	319.3	251.2
19	156	15	9.6	57	0	0.0	41	1	2.4	362.1	319.3	253.6
20	156	12	7.7	57	4	7.0	41	1	2.4	369.8	326.3	256.0

NOTE: Every wife who had completed one year of married life, even though only one, is included for that specific year, and every wife who completed two years of married life for that year, et cetera, with the result that the number of wives for whom rates were computed changes year by year in the younger age groups.

[1]Rates for single years of married life have been added together, thus utilizing the most significant rates available at each period.

Table 4. Birth rates in successive years of married life for native-born women in different occupational classes who had married under twenty-five years of age and were living in rural Cattaraugus County in 1929–1930.

are of especial interest because they indicate the rapidity with which the average "natural family" is built up in different occupational groups in a rural area. For example, after

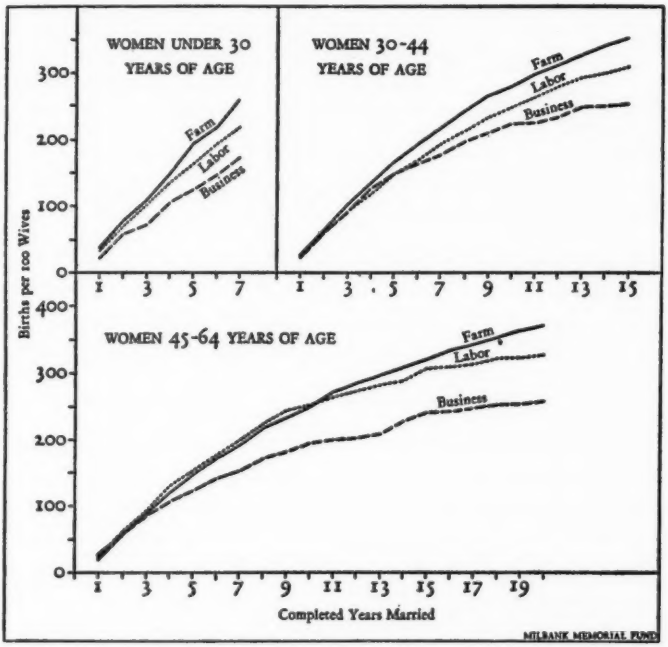


Fig. 1. Cumulated birth rates for successive years of married life in native-born women in different occupational classes in rural Cattaraugus County. Rates are shown for women in three broad age groups as of 1929-1930 who had married before age 25.

seven years of married life 100 women married under 25 and 30-44 years of age in 1929-1930 had borne on an average 216 children if in the farmer group, 192 if in the labor group, and 175 if in the business group. Similar differences according to occupational class are to be found for women under 30 years of age and in the age period 45-64 in 1929-1930. Thus the

tions of marriage to women differentiated according to age groups in 1929–1930 within each occupational class. The cumulated rates were found simply by adding the rates for specific years of marriage and are essentially the same, as found by actual tests, as would be obtained by computing rates for women who had completed a given "exposure to risk."

	All Intervals	Length of Intervals, in Months						
		0–6	7–11	12–17	18–23	24–35	36–59	60+
Number of wives	326	13	82	59	46	57	46	36
Per cent	100.0	4.0	21.2	18.1	14.1	17.5	14.1	11.0

Table 5. Interval between marriage and first birth.

differential fecundity rates are not only consistent but persist over a long period of time, and are true for women of widely different ages when length of "exposure" is held constant and marriage takes place before the age of twenty-five years.

FREQUENCY OF BIRTHS TO THE SAME MOTHER

A consideration of frequency of births naturally suggests the length of intervals between marriage and first birth and between successive births. As the date of each birth and stillbirth was ascertained as accurately as practicable, it is possible to present certain data on intervals which, because of their infrequency in literature on human fertility, are not without interest, in spite of the small numbers used.

It is by no means assumed that the records of intervals between marriage and the birth of the first child are complete or accurate in all cases. Obviously a reluctance to give exact information in instances where the interval was less than the normal period of gestation is to be expected. Yet the extraordinary willingness on the part of the wives residing in the area to cooperate in giving information freely and fully, as well as the guarantee on the part of the investigator that this information would be used for statistical purposes only, go far to lessen the amount of error that one might expect. The possibility of this inaccuracy relates, of course, to the shortest intervals. The frequency with which the first births occurred at various intervals after marriage in the entire

group of wives who were 40 to 59 years of age at the time of the enumeration and had married before the age of 30 is summarized in Table 5.

No particular element of inaccuracy was evident in the information relating to intervals longer than the normal period of gestation between marriage and the first child or in the intervals between the births of later children. The information obtained is given in summary form in Table 6, frequency distributions rather than average intervals being shown. Two comments on this table suggest themselves. One is that the proportion of long intervals is large. Whatever may be the causes, this bit of evidence does not support the assumption, not infrequently made, that fecundity in a rural population is unrestrained. On the other hand it is by no means any proof of deliberate control of the size of families. It is merely a statement of fact, as ascertained for this population group, and can be interpreted in no other way than to say that there is a considerable variability among native white women of native stock living in a rural area with respect to the length of interval between the children they bear. This is, of course, consistent with the finding that these women vary in fecund-

Table 6. Interval between marriage and first child and between successive births to native-born women married under thirty years of age who were 40–59 years of age and living in rural Cattaraugus County in 1929-1930.

Length of Interval	Percentage Distribution of Intervals Between					Number of Births after Specified Intervals Between				
	Marriage and First Birth	First and Second Birth	Second and Third Birth	Third and Fourth Birth	Fourth and Fifth Birth	Marriage and First Birth	First and Second Birth	Second and Third Birth	Third and Fourth Birth	Fourth and Fifth Birth
All intervals	*100.0*	*100.0*	*100.0*	*100.0*	*100.1*	*313*	*271*	*205*	*145*	*96*
Under 18 months	40.9	22.9	10.2	11.0	6.3	128	62	21	16	6
18-23 "	14.1	19.9	22.0	14.5	14.6	46	54	45	21	14
24-35 "	18.2	23.2	24.4	29.7	30.2	57	63	50	43	29
36-59 "	14.7	19.6	28.3	26.9	29.2	46	53	58	39	28
5- 9 years	7.7	11.1	12.2	14.5	17.7	24	30	25	21	17
10 years or longer	3.8	3.3	2.9	3.4	2.1	12	9	6	5	2

ity and fertility. The second comment, which probably has some bearing on the first, is that the longer intervals occur relatively more often between the births of later children than between the first additions to the family.

The further interesting indication is given that the shortest intervals occur in the farm group, the longest intervals in the business group, with the labor group between the two. Table 7 summarizes the statistics on this point by showing the proportion of women in each group who had intervals of three years or longer between marriage and the first birth, between first and second birth, and second and third birth. This indication is significant, perhaps, of the nature of the differential fecundity rates in a rural area, but it does not point definitely to the nature of the underlying factors involved.

FERTILITY OF FARMERS' WIVES IN 1900, 1910, AND 1929–1930

The extent and character of the changes in the fertility of the various racial and other component groups of the American people have long occupied the attention of students of population questions. They are questions not merely of academic interest, however; they are of deep significance to everyone to whom future social and biological trends are matters of intelligent concern. The present study is but a fragment of much needed information. It is suggestive of the kind of results that may be anticipated if similar methods of study are used on a larger scale.

In comparing the fertility rates as found in 1929-1930 with those of 1910 and 1900, a factor of environment can be held constant, in some degree, by considering only native white farmers' wives of native stock who were living on farms in the same county.[5] That is to say, we are comparing fertility

[5]The samples for 1900 and 1910 were taken from the federal census records. For the method used in drawing the samples, *see* Sydenstricker, Edgar, and Notestein, Frank W.: *ibid.*

Order of Interval	Total Births			Births Occurring After Intervals of 3 Years or Longer					
				Number			Per Cent		
	Farm	Labor	Business	Farm	Labor	Business	Farm	Labor	Business
Marriage and first birth	202	70	41	52	16	14	25.7	22.9	34.1
First and second birth	178	59	34	51	26	15	28.7	44.1	44.1
Second and third birth	138	48	19	57	22	10	41.3	45.8	52.6

Table 7. Frequency of births occurring at intervals of three years or longer to native-born women in different occupational classes living in rural Cattaraugus County 40 to 59 years of age who had married before the age of 30, in 1929–1930.

rates of women of similar stock and occupational status at different periods in a strictly rural environment that has undergone little change. When such a comparison is made, the extremely interesting fact emerges that no significantly downward trend has occurred in the fertility rate of wives of farmers of native stock in this typical rural area of this section of the country. The results are summarized in Table 8. Here it is shown that, after allowing for whatever differences may have existed in the ages of the wives included in the three samples, the number of children found to have been born per 100 women was not less in 1929-1930 than in 1900 or 1910. This is indicated for women under 45 years as well as for women of all ages.[6] The cumulative rates for women at different ages (Table 9) present the evidence in greater detail. It will be noted that the curves as plotted in Figure 2 are

[6]The influence of age at marriage should be much the same in each sample since the mean age of marriage was 20.8 in 1900, 21.0 in 1910, and 21.2 in 1929, for farm women who, at each date, had been married 5–14 years. When the number of women is taken into account, these slight differences are not significant.

Year	Standardized Rate[1] per 100 Wives		Number of Wives in Sample	
	All Ages	Under 45 Years	All Ages	Under 45 Years
1929	298	276	598	301
1910	269	234	1,520	623
1900	285	251	1,128	637

[1]To the age distribution of an urban and rural sample of 99,226 wives drawn from the 1910 census records.

Table 8. Standardized cumulative birth rates for wives of farmers in Cattaraugus County in the years 1929, 1910, 1900.

essentially similar in that they reach about the same level after 45 years of age.[7]

The slightly higher standardized rate for women under 45 in 1929 than in 1910 or 1900 (Table 8) is contrary to what would have been expected in view of a declining birth rate. Birth registration in New York State was incomplete prior to 1916, but for the period 1916-1927 Downes[8] has given the birth rates for the rural part of Cattaraugus County with more than usual accuracy since she corrected them for residence of mothers. Although these rates do show a definite decrease, the decrease occurred only in 1925-1927; in the postwar period of 1920-1924 an actual increase appeared.[9] Now our cumulative birth rates for 1929 as plotted in Figure 2 are consistently higher in the ages under 45, particularly at 25-29. Since any significant variation peculiar to the child-

[7]In the 1900 sample the successive age rates after 45 suggest the possibility of a slight trend. Since the number of cases is small and the rates are not confirmed by the rates for women ten years older in 1910, no definite conclusion as to this point can be drawn.

[8]Downes, Jean: The Accuracy of the Recorded Birth Statistics in Urban and Rural Areas. *Journal of the American Statistical Association*, March, 1929, xxiv, New Series, No. 165, pp. 23, 25.

[9]The series of annual birth rates per 1,000 rural women aged 15–44 beginning in 1916 is as follows: 97.9; 87.2; 94.8; 89.2; 96.7; 100.6; 98.1; 86.7; 86.0; 77.4; 70.3; 69.0.

Age of Wife at Census	Births per 100 Wives			Number of Wives			Number of Births		
	1929	1910	1900	1929	1910	1900	1929	1910	1900
Total	*324*	*285*	*305*	*598*	*1,520*	*1,128*	*1,932*	*4,328*	*3,443*
Under 20	57	78	60	7	23	15	4	18	9
20–24	136	117	142	39	147	113	53	172	161
25–29	263	175	209	62	194	115	163	339	240
30–34	293	249	270	56	196	129	164	489	348
35–39	323	319	336	65	181	115	210	577	386
40–44	397	346	327	72	156	150	286	540	491
45–54	340	354	354	135	284	234	459	1,006	828
55–64	354	328	368	90	227	171	319	744	629
65+	381	396	408	72	112	86	274	443	351

Table 9. Cumulative birth rates in 1900, 1910, 1929 for native-born married women of specific ages living on farms in Cattaraugus County.

bearing period will reflect some condition or conditions operating in the decade or more before the time the enumeration was made, it is reasonable to assume that the higher rates for women of childbearing age in 1929-1930 were due chiefly to such a condition; had not such a condition existed, no significant differences in the curves of cumulative rates for 1900, 1910, and 1929-1930 would have appeared. The rise in the postwar birth rate thus seems to be reflected in the apparently higher fertility of the younger women as recorded in 1929-1930. The drop in the birth rate since 1925 in this area may, however, present a different situation in 1935 or 1940; but that is another story for the future.

It is unwise, of course, to draw any sweeping conclusions from a single small population. Nevertheless this study of fertility rates of native white women in a rural area not greatly affected by urban influences up to 1930 is not without interest. It suggests one mode of research in population prob-

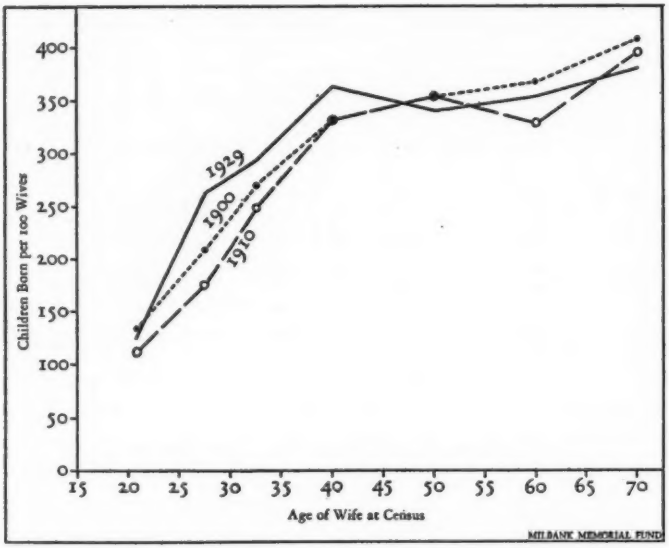


Fig. 2. Cumulative birth rates for native-born married women living on farms in Cattaraugus County, by specific ages as of 1900, 1910, and 1929-1930.

lems which, in this instance, yields suggestive evidence of unchanging fertility of our native stock under a not greatly changing environment. More evidence of this kind would throw light on the important question of whether or not the general decline in the fertility of our so-called "older native stock" is a sign of lessened vitality or is a concomitant of changing environment and all that is implied thereby.[10]

[10]Notestein, in an earlier paper of this series, compared the size of families of women aged 60–64 with those for women aged 40–44 in 1910, and showed that "the shift from large to small families is less marked among the wives of farm owners than in the urban classes." His data, however, covered the rural parts of seventy-four counties scattered over a large section of the northern part of the United States. *See* Notestein, Frank W.: The Decrease in Size of Families from 1890 to 1910. Milbank Memorial Fund *Quarterly Bulletin*, October, 1931, ix, pp. 181–188.

FINAL CONTRIBUTION OF THE NEW YORK COMMISSION ON VENTILATION

THE publication in October of the final report of the New York Commission on Ventilation marked the conclusion of the research studies of this body, which have been characterized as among the most important contributions in recent years to the health and welfare of school children throughout the country. The results of the long and exhaustive investigations of the Commission, which was appointed some years ago by the Governor of the State of New York to conduct experiments to determine the best methods of ventilating school buildings, are summed up in this volume issued by the Bureau of Publications of Teachers College, Columbia University, under the title "School Ventilation: Principles and Practices." It sells at $1.00 a copy. The report represents the joint effort of the committee as it was constituted during the latter years of the investigation, 1926 to 1929. Its members include C.-E. A. Winslow, chairman; Rufus Cole, Dwight D. Kimball, Frederic S. Lee, George T. Palmer, Earle B. Phelps, and Edward Lee Thorndike.

The results of the earlier work of the official State Commission appointed in 1913 were incorporated in an exhaustive report issued in 1923. The present volume contains the findings of the body formed to carry on the investigations of this original Commission, which was discontinued as a result of changes in the State constitution. Confirming in general the main conclusions of the earlier report, the volume just issued points out how existing building legislation in many states relative to school ventilation is based on outworn theories, and makes definite recommendations for an ideal ventilation

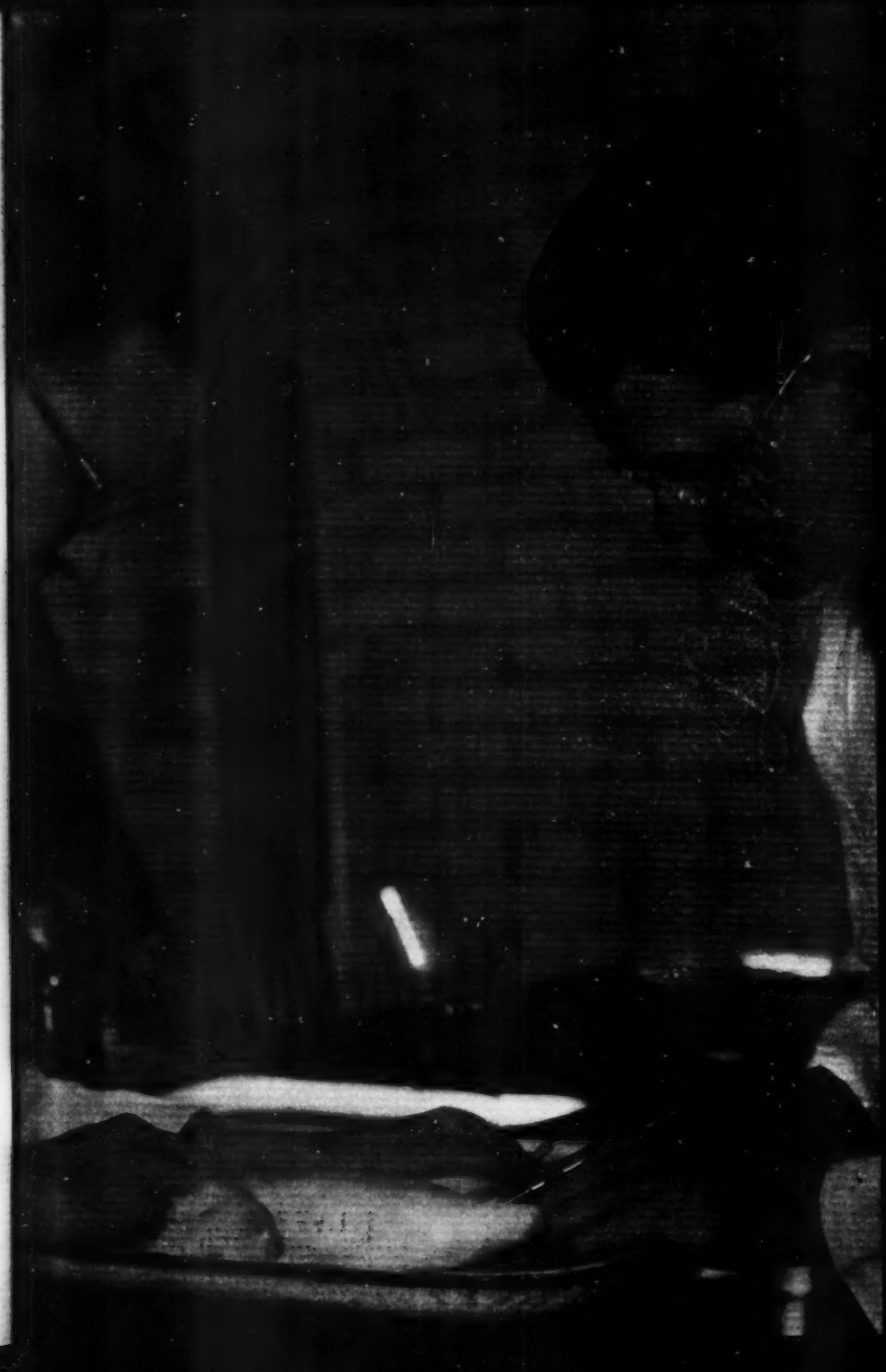
law which would save many hundreds of thousands of dollars annually while adequately safeguarding the health of several million school children.

The twenty states which in the opinion of the Commission retain statutes or other regulations concerning school ventilation based on disproved or antiquated theories are: Florida, Idaho, Illinois, Indiana, Maine, Massachusetts, Michigan, Montana, New Jersey, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Vermont, West Virginia, and Wisconsin.

The report makes clear, however, that the Commission fully recognizes the remarkable achievements of the art of mechanical ventilation and its great value in dealing with many indoor conditions. Two members of the New York Commission on Ventilation, it is pointed out, served as members, and one of them as chairman, of the special commission appointed by the federal government to draw up specifications for the ventilation of the Houses of Congress. "In that capacity," says the report, "they recommended the most elaborate type of mechanical ventilation, and the resulting system, as designed by W. H. Carrier, has been outstandingly successful.

"For auditoria holding one hundred people or more," the report continues, "for large offices and workrooms, for industrial establishments where excessive heat or moisture or dusts or poisonous fumes are produced, fan ventilation is essential. In certain schools where outdoor noise or dust or odors may make it inadvisable to keep windows open, fan ventilation will be the method of choice.

"In many classrooms, however, we are convinced that window-gravity ventilation will provide an entirely satisfactory solution of the problem of ventilation, and we believe that under such conditions this system may be preferred for



the schoolroom, as producing equally healthful and more comfortable conditions."

The history of the whole subject of ventilation is briefly considered in the opening chapter of the present report. The conflicting theories and the prevailing uncertainty about ventilation are discussed, together with the other reasons leading to the establishment of the Commission by the Governor of the State of New York at the request of the Milbank Memorial Fund. The original body included a ventilating engineer, a physiologist, a physician, a chemist, a psychologist, and a sanitarian. Special rooms for physiological and psychological investigation of the results of various air conditions were set aside and equipped at the College of the City of New York. The results of various types of ventilation under ordinary classroom conditions were also studied in twenty schools in the City of New York, six in Springfield, Massachusetts, and one each in Fairfield, Connecticut, and Minneapolis. All this research and experimentation by the original Commission was carried on between June, 1913, and April, 1917. The war postponed the publication of the final report of the Commission's activities until 1923, after which the original Commission passed out of existence.

Three years later, however, in 1926, evidence had grown overwhelmingly strong, says the present report, that the one important essential in school ventilation was the maintenance of an atmosphere which would remove the heat produced in metabolism so as to avoid overheating, without unpleasant drafts. "It seemed obvious that such an end could be attained without a large flow of air; and experience with window-gravity ventilation in many cities had shown that such was, in fact, the case. State legislation still generally insisted, however, upon the thirty cubic-foot standard. It seemed desirable, therefore, to undertake further experi-

mental studies of the problem, to widen our base of experience and to determine whether the thermal theory of ventilation was in error, or, if not, whether such evidence could be obtained as to warrant the changing of current legal standards."

Since the original Commission could not be reconstituted as an official body in view of changes in the State constitution, it was reestablished as the New York Commission on Ventilation at the invitation of the Milbank Memorial Fund, but with the same personnel as in 1913–1923 with two exceptions. Rufus Cole replaced James Alexander Miller as its medical member and George T. Palmer, who had been chief of its investigating staff in 1913-1923, was made a member.

The newly constituted group carried on, during the years 1923-1926, practical investigations under normal schoolroom conditions in Syracuse and Cattaraugus County, New York, and in the City of New York, in conjunction with the New York Health Demonstrations, aided by the Milbank Memorial Fund in these localities. Other experimental projects made possible by grants from the Commission included special studies on body radiation, on the effect of local drafts, and on school absenteeism in relation to respiratory diseases and ventilation. These studies were carried on respectively at the Smithsonian Institution, the Yale School of Medicine, and the University of Chicago. The study of actual schoolroom conditions confirmed the findings of the original Commission that even slight overheating has a marked deleterious effect, physically and psychologically. It is the belief of the Commission that fundamental principles only should be embodied in any legislation relative to the subject of ventilation. Hygienists would approach every individual problem with the sole thought of attaining certain specified conditions of temperature, with freedom from drafts and with, perhaps, a liberal carbon dioxide standard. The engineering profession,

however, greatly prefers concrete specifications of apparatus to be provided, which can be met with certainty.

"There is very serious objection, however," the report continues, "to the crystallization in legal form of such minute and detailed specifications as would be necessary if this plan were to be effectively carried out. The art of ventilation changes from year to year. It is subject to wide variations in its application to different buildings. It differs in its application to the same buildings at the same time in the hands of equally competent engineering experts. If regulations of the type proposed are to be effective at all, they must be very precise and definite; but to enact into law the precise and definite details which happen to appeal to a particular group of experts at a given time would not only put a stop to progress in the future but would create a condition intolerable to the engineer who desires to approach his problems of today and tomorrow with imagination and creative power."

Another approach in framing a model law, and the one favored by the Commission, would specify the general objectives to be attained and would confer upon a small expert group the power to determine whether a given design is reasonably adequate to attain those objectives. "This is essentially the procedure involved in all modern legislation with regard to public health and industrial conditions," the report concludes, "the principles only being embodied in the law and the details being subject to determination by a Board of Health or an Industrial Commission in the individual case."

The recommendations of the Commission are as follows:

> 1. The major objectives of schoolroom ventilation shall be the elimination of heat from the body surface without the production of objectionable drafts. This means the maintenance of a room temperature of 65 degrees Fahrenheit in corridors, gymnasiums, and shops; of 75 degrees in

swimming pools and adjacent dressing rooms; and of 68 degrees in all other occupied rooms.

2. The avoidance of overheating is of primary importance for the promotion of comfort and efficiency and the maintenance of resistance against disease. Sources of direct radiation, therefore, shall be so designed or protected as to prevent overheating of persons in adjacent seats.

3. All classrooms shall have at least 15 square feet of floor space and 200 cubic feet of air space per pupil and shall have a system of heating and ventilation which shall provide means of air supply and exhaust capable of avoiding unpleasant odors and of avoiding, without chilling drafts, an increase of room temperature above 68 degrees Fahrenheit.

4. Such ventilation shall be accomplished by any means which will attain satisfactorily these specified results. For the average school, favorably located, window-gravity (open-window) ventilation seems to be the method of choice on grounds of comfort and economy.

5. Every schoolroom used for instruction, study, assembly, and physical recreation shall be provided with at least one thermometer of a grade that will give a reading accurate to within one degree Fahrenheit. The thermometer should be so located as to give a representative reading of temperature at the breathing plane of the pupils.

"Such a law," the report states, "would permit the engineer and the architect to present any design which in their judgment would attain these objectives. Finally, it would require that the State Board of Education, the State Board of Health, or such other official agency as may be designated approve the plans as submitted. It is exactly in line with the procedure now followed with regard to water supply and waste disposal; and it appears to guarantee a maximum of protection for the public with a minimum of interference with freedom of initiative on the part of the designer."

AN EPIDEMIOLOGICAL STUDY OF A RURAL OUTBREAK OF WHOOPING COUGH[1]

by TRAVIS P. BURROUGHS, M.D.

THE need for epidemiological studies of whooping cough is well recognized.[2] The studies so far made have been confined largely to records of reported cases and thus are incomplete for the reason that only a small proportion of the cases are ordinarily reported to the health department. In this study a somewhat new method of approach was attempted, namely, an intensive observation of cases as they developed in a strictly rural population where an accurate record could be made not only of the complete incidence of cases, but also of persons coming into contact with these cases in various ways. Because of the small number of cases involved, it is realized that the statistical results are of limited significance. However, as an experiment in epidemiological methods of observation it is not without interest.

The outbreak took place during January and February, 1931, in a rural area of about three square miles in Cattaraugus County, New York. Thirty-one families, containing 110 persons, resided in this area which roughly comprised a single school district. It was essentially a typical rural neighborhood of western New York. Eleven of the thirty-one families

[1]From the Cattaraugus County Department of Health and the Division of Research, Milbank Memorial Fund. Dr. Burroughs is Deputy Commissioner of Health in Cattaraugus County. The field investigations were made by E. Helen MacChesney, R.N., to whom acknowledgment is due for arduous and effective work. Advice on the study was given by Dr. Wade H. Frost.

This is the first of a series of studies of whooping cough and other communicable diseases in Cattaraugus County. Another outbreak of whooping cough was under observation late in 1931 and will be reported upon in a later paper.

[2]Godfrey, E. S., M.D.: Epidemiology of Whooping Cough. *New York State Journal of Medicine*, December 1, 1928, xlviii, pp. 1410–1415.

constituted a small hamlet which was the social and trading center for this school district as well as for an adjoining school district. In the hamlet were the school, a church, a garage, and a general store. The principal industry was dairying, most of the farms being operated by the owners. Several families accommodated tourists, but during January and February there was little travel. One man worked on a railroad, three drove milk-collecting trucks, and several worked in near-by milk-collecting plants. The economic condition of the neighborhood was not out of the ordinary, six of the families being regarded as in good economic condition, fourteen as fair, ten as poor, and one as very poor. Figure 1 indicates the location of the households, church, store, and school in relation to the highway and local roads.

The outbreak was well limited both geographically and chronologically. The first case was introduced on January 5th. Subsequent to this and prior to the recovery of all cases of whooping cough, fifty-nine persons developed respiratory symptoms involving cough. Forty-nine of these fell into the group of common colds. Ten cases of whooping cough developed in the area during January and February and since then none to the present writing, November 1, 1931.

Method of Observation. The case imported on January 5th was discovered on January 14th, and on that day investigation was begun in order to observe closely the possible development of subsequent cases. The method of the study was to visit every family in the entire area every two weeks, and to obtain as accurate information as possible relative to current respiratory attacks of every variety; to get a record of all contacts with the general public at neighborhood gatherings, such as took place at the Grange, Ladies Aid, the general store, the church, or the school; and to discover current exposure to ersons with whooping cough or any other respira-

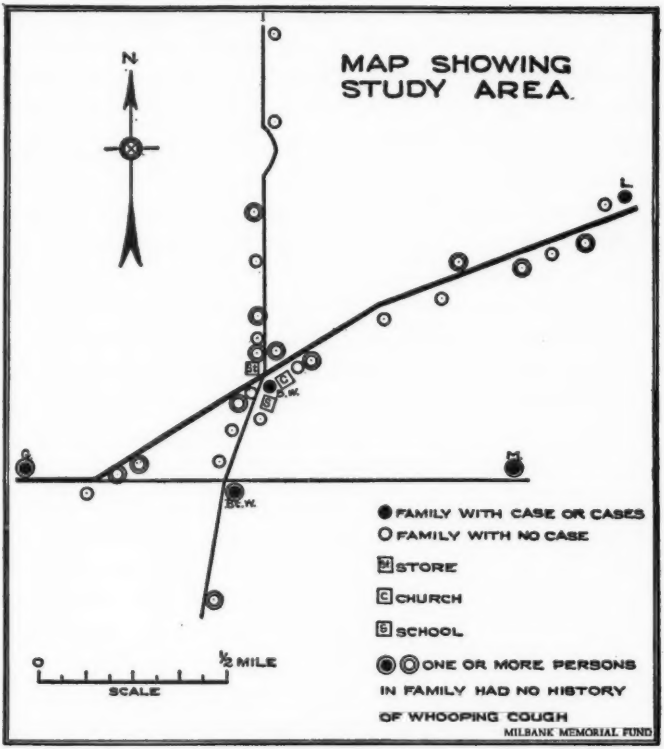


Fig. 1. Area of whooping cough outbreak in rural Cattaraugus County, December 25, 1930 to February 28, 1931.

tory disorder. This information was recorded for each individual on sheets headed, "contact with disease diagnosed as whooping cough," "contact with undiagnosed upper respiratory infections," "contact with neighborhood public," and "contact with public out of the neighborhood." At the first visit a census of every household was taken.

In order to determine as completely as possible the total incidence of the disease, careful observation was instituted

whenever any respiratory symptom appeared and was maintained until the termination of the disorder, a narrative being kept for each person under the heading, "history of illness." Especial watch was kept for symptoms of differential value, such as prolonged coughing, truly paroxysmal coughing or sneezing, vomiting, croupy cough, and whooping. Coughing and sneezing were considered truly paroxysmal when several coughs or sneezes occurred on a single expiration. For persons with whooping cough a narrative was kept headed, "persons with whom individual is known to have had contact."

Experience in tentative investigations of the same character in other areas in Cattaraugus County had shown that the proportion of apparently atypical cases found in an outbreak was less when the interval between the investigational visits was shorter. When much time had elapsed, the parents would occasionally forget even such striking manifestations as whooping or vomiting until it was recalled to their minds.[3]

It became evident in the present experience that when the elapsed time was more than a week, significant details were forgotten and dates confused. Beginning on March 4th, therefore, the visits were made weekly. At this interval observation of contacts and of the prevalence of respiratory disease was satisfactory. Weekly visits were continued until six weeks after the onset of the last suspicious cough. Thereafter for two months coughing convalescents and all persons reported never to have had the disease were observed.

Results of Observation. The chronology and extent of the outbreak may be summarized as follows: the first or imported case, B.W., age 5, onset January 5th, and the next two cases, C.W., age 5, and E.W., age 9, whose onsets were January 9th and 10th, respectively, were all exposed to one

[3]Dr. Luttinger mentions this same point. Luttinger, P., M.D.: The Epidemiology of Pertussis. *American Journal of Diseases of Children*, September, 1916, xii, pp. 290–315.

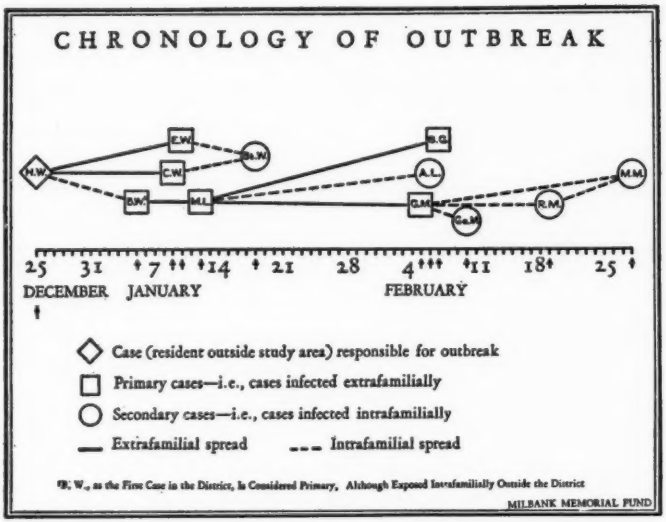


Fig. 2. Date of onset and mode of contact of each case of whooping cough in an outbreak in a rural area of Cattaraugus County, December 25, 1930 to February 28, 1931.

H.W., age 6, brother of B.W., and nephew of C.W. and E.W., the exposure being familial for B.W., and extrafamilial for E.W. and C.W. in their own home. Bt.W., age 53, whose onset was January 18th, was the father of E.W. and C.W., and was exposed familially to them. At school, M.L., age 9, was exposed daily to B.W., and began to cough on January 12th. She familially exposed her mother A.L., age 25, whose onset was February 6th. At school M.L. also exposed G.M., age 12, whose cough was dated by his mother from February 5th, and B.G., age 6, whose onset was February 7th. In his family, G.M. exposed Ga.M., age 7, a brother who had no other exposure and whose onset was February 10th. In the same family, R.M., age 5, was exposed to both G.M. and Ga.M., and began to cough on February 19th.

Number of Persons in Family	Number of Families	Number of Families Attacked	Per Cent of Families Attacked
Total	*31*	*5*	*16.0*
1	1	0	10.0
2	9	1	
3	7	1	14.0
4	6	1	17.0
5	5	1	20.0
6	2	0	33.0
9	1	1	

Table 1. Per cent of families in which whooping cough cases occurred, by size of family.

A sister of these three, M.M., age 8, was exposed to all of them and developed symptoms on February 28th. This was the last case in the neighborhood. (Figure 2.)

Of the thirty-one families, five were definitely attacked by the disease. The geographical distribution is shown in Figure 1, and the distribution according to size of family in Table 1.

In the five attacked families there were twenty-three persons. Six of the eleven cases, including the initial case in the neighborhood, were primary cases, leaving seventeen persons, among whom five secondary attacks occurred, or a gross secondary attack rate of 29 per cent. The distribution of cases and attack rates by age groups was as shown in Table 2.

This age incidence of whooping cough is unusual, since ordinarily the highest rate is among children under five years,[4] but this experience may be regarded as not unlikely in small population groups and in sparsely settled areas. In this outbreak, four of the eight children under the age of five

[4]Sydenstricker, Edgar: Hagerstown Morbidity Studies No. VIII, The Incidence of Various Diseases According to Age. *Public Health Reports*, May 11, 1928, xliii, pp. 1124–1156.

years were not exposed at all. One was exposed to a patient whose onset was more than eight weeks previous. Two had play contact in the home on a single occasion with a patient in the first week of illness, and one played at home and in the store on five days with patients in the first week of disease. No child under five had familial[5] exposure.

Table 2. Age incidence of cases.

Age Groups	Number of Persons	Cases	Per Cent of Persons Attacked
All ages	*110*	*11*	*10.0*
0–4	8	0	0.0
5–19	28	9	32.0
20 and over	74	2	2.7

Among the factors involved in the spread of this disease in a population, three seem to be of principal importance: (1) Infectiousness of the cases, especially at different stages; (2) susceptibility of the population; (3) contact of susceptible persons with patients in an infectious stage.

Although these factors cannot be regarded as operating independently, it will be easier to summarize the evidence bearing on each before considering them together.

Whooping cough is thought to be most infectious in its earliest stages,[6] and it is in the first weeks of its course that Hemophilus pertussis is thrown off in the largest numbers,[7] thereafter becoming increasingly difficult to demonstrate. In eight cases of the present series, there had been exposure to

[5]"Familial" includes contacts in the household between persons resident there. Under the term "extrafamilial," "home" includes contacts between persons one or both resident elsewhere; "school" includes contacts in the school and on the school playground; "store" includes contacts between customer and customer, or customer and clerk; and "other" includes contacts at Grange, Ladies Aid, and outdoors.

[6]See footnote 3, p. 44.

[7]Lawson, G. M., M.D., and Mueller, M.: The Bacteriology of Whooping Cough. *Journal of the American Medical Association*, July 23, 1927, lxxxix, p. 275.

Duration of Case at Time Exposure Occurred	Total Persons Exposed			Persons Without History of Previous Attack		
	Persons	Cases	Per Cent Attacked	Persons	Cases	Per Cent Attacked
Less than 3 weeks	54	8	15.0	18	6	33.0
3 to 4 weeks	43	3	7.0	11	2	18.0
5 to 8 weeks	60	0	0.0	15	0	0.0
Over 8 weeks	13	0	0.0	1	0	0.0

Table 3. Incidence of whooping cough among persons exposed to whooping cough at different durations.

the disease during its first week, and in the other three cases, exposure during or prior to its third week. (Table 3.)

The history of previous attacks in the population was obtained at the first visit. These histories are summarized and compared with other findings of a similar kind in Table 4.

In this investigation, although the numbers are small, it is interesting to note that the lag in the percentage is greater for this strictly rural area than for five rural townships of the County where there are a few villages with populations up to 1,000, and is much greater than for urban communities.

Three persons with a history of a previous attack had second attacks during this outbreak. One of them, M.L., a girl of 9, had a light case with whooping at the age of 2, according to the statement of her father and grandfather; the present attack was typical, with both whooping and vomiting. A.L., age 25, mother of M.L., was stated by her father to have had typical whooping cough with whoop at the age of 8, at a time of local and familial prevalence; the present attack was characterized by a cough of sixty-six days' duration, with prolonged paroxysms of coughing, lacrimation, facial suffusion, and frequently with gagging at the end of the paroxysm. The third case was that of a man, Bt.W., age 53,

who, according to his mother's statement, had had typical whooping cough when he was about five years old, at a time of familial prevalence; the present attack was also typical and characterized by vomiting.

Second attacks are generally described as rare, Laing and Hay[8] reporting a rate of only 0.26 per cent in a series of 20,405 cases, but Hemophilus pertussis is sometimes isolated from presumably immune persons who have been exposed to the disease and who present some respiratory symptoms.[9] Bearing in mind that the number of persons in this study is small and the effect of a few inaccurate histories may be large, the attack rate (Table 5) of 3.8 per cent among persons with a positive history of previous attacks is not significantly different from a rate of 2.2 per cent reported for two outbreaks of the disease in Hagerstown, Maryland,[10] and is

Table 4. History of prior attacks of whooping cough.

Age Groups	This Investigation			Other Areas—Per Cent	
	Total Persons	Persons with Positive Histories		Five Rural Townships[1]	Various Urban[2]
		Number	Per Cent		
Total	*110*	*76*	*69.0*		
0–4	8	0	0.0	19.0	38.0
5–19	28	16	57.0	64.0	75.0
20 and over	74	60	81.0	78.0	77.0

[1]Sydenstricker, Edgar, and Collins, Selwyn D.: Age Incidence of Communicable Diseases in a Rural Population. *Public Health Reports*, January 16, 1931, xlvi, pp. 100–113.

[2]Collins, Selwyn D.: Age Incidence of the Common Communicable Diseases of Children. *Public Health Reports*, April 5, 1929, xliv, pp. 763–826.

[8]Laing, J. S., and Hay, M.: Whooping Cough in Aberdeen. *Public Health*, July, 1902, xiv, pp. 584–589. Quoted by Stallybrass in "Principles of Epidemiology," p. 254.

[9]See footnote 7, p. 47.

[10]Sydenstricker, Edgar: Private communication based upon studies in Hagerstown in 1921–1924.

Age Group	With History of Attack			Without History of Attack		
	Persons	Cases	Per Cent	Persons	Cases	Per Cent
Total	*76*	*3*	*3.8*	*34*	*8*	*24.0*
0–4	0	0	—	8	0	0.0
5–19	16	1	6.2	12	8	66.0
20 or over	60	2	3.3	14	0	0.0

Table 5. Attack rate among persons with and without history of attack.

roughly one-sixth the magnitude of the attack rate among persons with no history of a previous attack.

In gathering information in regard to exposure, the investigator was careful to keep in touch with all local activities and to check the information from one informant with that from all others. When there was a conflict of statements, an attempt to reconcile them was made on the next visit. By friendly cooperation, a clear oversight was maintained over local contacts. A history of definite contact with one or more persons having prolonged paroxysmal cough, accompanied in seven instances by whooping and vomiting, and in the other four instances by vomiting, was obtained for each of the eleven persons exhibiting the disease.

The number of contacts that persons ill with whooping cough had in the population was surprising, particularly for the winter season in a rural area. Familial contacts of patients, identical for all weeks of the illness, included all persons in the homes affected. The sixteen school children were exposed for five consecutive weeks to children with unrecognized whooping cough of less than three weeks' duration.

Exclusive of familial and school exposures, each patient had seven to ten contacts per week, chiefly with adults.

Except for the first week of illness, which showed the greatest number, the gross amount of these varied little during the course of the illness. The number of persons thus exposed per week was nearly constant at a level of about three until the last weeks, when exposures at Grange and Ladies Aid made a nearly tenfold increase. There were a few contacts outdoors that were considered exposures.

Of the fifty-nine persons who were exposed to the disease during the first four weeks of its duration, fifty were exposed in only one way. Nine persons were exposed in two ways, seven having extrafamilial exposure at home in addition to exposure in the family, at school, or other. For these nine instances, the exposure apparently more significant was tabulated. (Tables 6 and 7)

The attack rate was greatest among persons with familial exposure and next greatest among those with school exposure. Attacks following extrafamilial exposure in the home were notably less frequent than those following familial

Table 6. Exposure to whooping cough in the first four weeks of its duration by type of exposure.

Type of Exposure	Number of Persons	Per Cent Population Exposed	Cases	Per Cent Exposed Persons Attacked
All	*110*	—	*11*	*10.0*
Familial	18	16.0	6	33.0
Extrafamilial[1]	*41*	*37.0*	*5*	*12.0*
Home	29	26.0	2	6.9
School[2]	11	10.0	3	22.0
Store[3]	1	0.9	0	0.0
None	51	46.0	0	0.0

[1]Excluding five persons with familial exposure.
[2]Excluding two persons with extrafamilial exposure.
[3]Excluding two persons with extrafamilial home exposure.

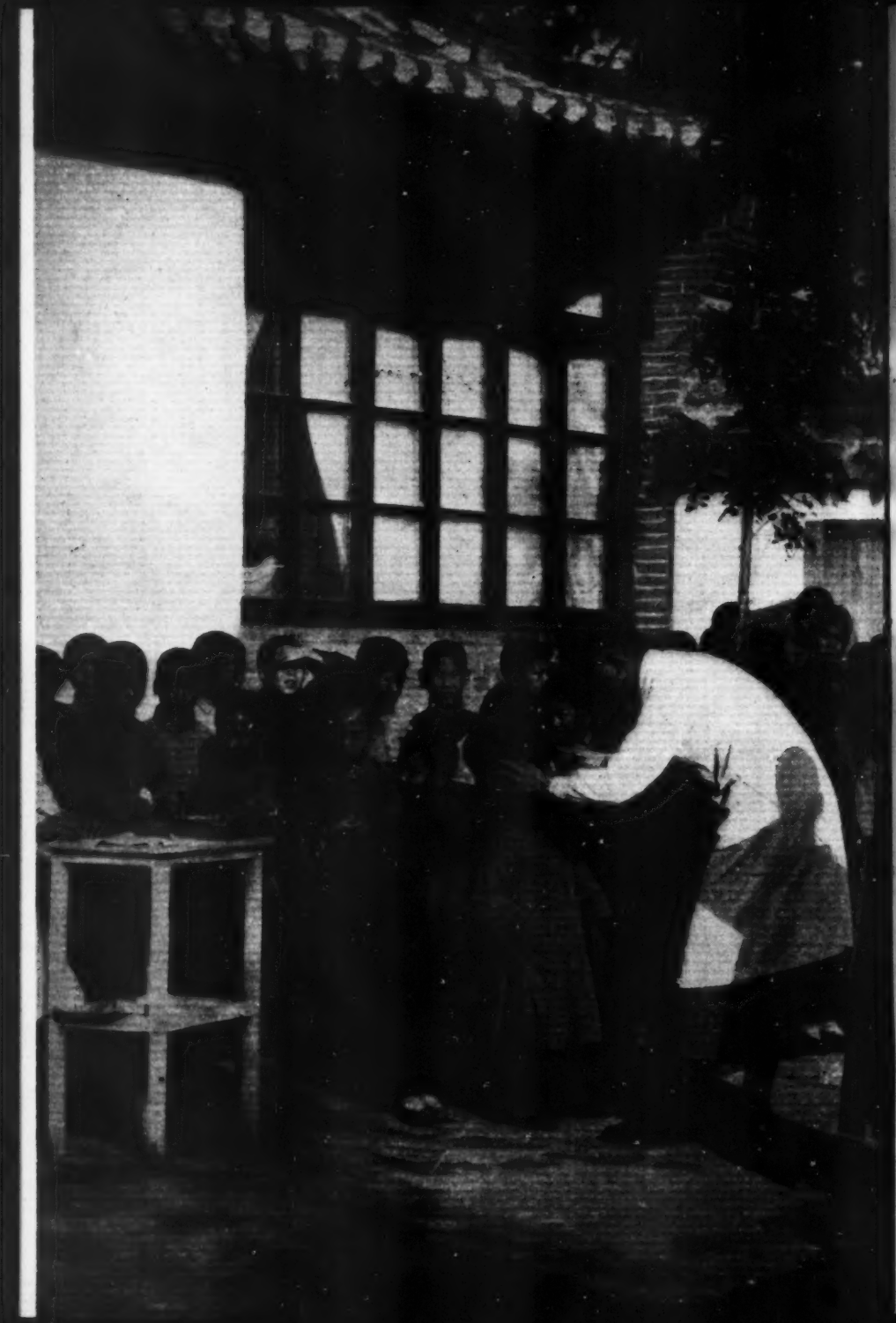
exposure. Exposure at the general store, Grange, Ladies Aid, or outdoors was followed by no cases.

In this rural neighborhood with a mean population density of thirty-one persons per square mile, over half the people, fifty-nine persons in 110, were exposed to active whooping cough during the first four weeks of the disease. In addition, twenty other persons were exposed during the fifth to eighth weeks, and five further persons were exposed to coughing convalescents after the eighth week, making a total of eighty-four persons exposed to whooping cough at some time. There were very few contacts between patients and children under the age of five, and no cases occurred in this age group. The eleven cases which occurred followed recognized familial, school, or extrafamilial home exposures. Three second attacks were recognized. At some time during the outbreak, forty-nine other persons showed respiratory disorders involving cough. All cases arose from contact with other cases during their first weeks before they could be diagnosed clinically.

Table 7. Exposure of persons with no history of whooping cough to whooping cough in the first four weeks of its duration by type of exposure.

Type of Exposure	Number of Persons	Per Cent of Susceptible Population Exposed	Cases	Per Cent Exposed Persons Attacked
All	*34*	—	*8*	*24.0*
Familial	6	18.0	4	66.0
Extrafamilial[1]	*14*	*41.0*	*4*	*29.0*
Home	9	26.0	2	22.0
School	*5*	*15.0*	*2*	*40.0*
Store[2]	0	0.0	0	0.0
None	14	41.0	0	0.0

[1]Excluding one person with familial exposure.
[2]Excluding one person with extrafamilial home exposure.



THE SECOND YEAR OF THE RURAL HEALTH EXPERIMENT IN TING HSIEN, CHINA

by HSUN-YUAN YAO, M.D.[1]

THIS greatly condensed review of the second year of the Ting Hsien public health experiment is a record of real accomplishment. To most of us it will read like the report of a typical health department in a small American city, or in one of our better organized counties, rather than like the statement of public health procedure in a remote Chinese rural area. Behind each dry detail of this report must be interpolated a story of hard work, ingenuity in adapting modern medicine and public health methods to Chinese conditions, and devotion to duty. Even those who have not the opportunity to know interior China can hardly fail to appreciate in some degree the significance of this achievement and to feel the inspiration it gives to medicine and public health in all countries, East and West.—EDGAR SYDENSTRICKER.

A STATEMENT of the program and a review of the first year's work of the Health Department of the Chinese National Association of the Mass Education Movement in Ting Hsien, China, have appeared in this *Bulletin*[2] before, and their repetition here is unnecessary. It might be helpful, however, to those who are entirely incognizant of the development in Ting Hsien, to give even a very brief statement of the conditions under which the health program has been launched.

The Chinese National Association of the Mass Education Movement is a private organization started thirteen years ago as a nation-wide movement against illiteracy. Since 1925, it has conducted in Ting Hsien a ten-year research program dealing not only with methods of elimination of illiteracy but also with agriculture and industry, public health, and citizenship training. The four main problems of rural

[1]Dr. Yao is head of the Department of Public Health, Chinese National Association of the Mass Education Movement.

[2]Milbank Memorial Fund *Quarterly Bulletin*, October, 1931, ix, pp. 104–107; *ibid*, July, 1931, ix, pp. 67–77.

reconstruction in the Chinese community, as the members of the Movement see it, are ignorance, poverty, physical weakness, and selfishness. The problems cannot be solved in a piecemeal way but must be attacked as a whole, because the success of any one effort depends on the concurrent progress of the others. For tackling the third problem, the Health Department was inaugurated in the fall of 1929 in cooperation with the Milbank Memorial Fund.

Ting Hsien is a typical rural district in North China, located about 170 miles south of Peiping (the former Peking) along the Peiping-Hankow railroad, having a population of about 400,000 scattered in the City (Ting Hsien City, the "county seat") and in the 472 villages around it. The population consists almost entirely of farmers. The average farmer family has 5.8 persons and lives upon about $250 Mexican annually (about $60 United States currency at the present rate of exchange). Over 90 per cent of the people were illiterate before the Mass Education Movement began its work. Topographically, the County is a flat countryside transversed with dirt roads. Carts, horses, and bicycles are the principal means of transportation. Politically, the County is administered from the district magistrate's office. Each village has one or two village elders responsible to the magistrate. Often the magistrate is changed before he gets orientated. Before the Health Department began its work, modern medical facilities were *nil* and public health work was almost unknown.

The initial health program of the Department is applied to an area of about one-sixth of the County. This health demonstration area, has about 178 square miles with a population of 47,522, of which 13,556 are in the City and its suburbs and 33,966 in seventy-two villages around it.

The principal aim of the health work in Ting Hsien is to attain a feasible program that is capable of duplication else-

where in rural China under prevailing economic and social conditions. This involves practical research work on the technique of adapting knowledge of curative and preventive medicine to Chinese conditions and the training of the proper personnel to carry out the work.

Space does not permit a fuller description, but it is hoped that this brief statement will give a glimpse of the conditions under which the Health Department is functioning.

Health Activities of the Second Year Ended June 30, 1931

Personnel. For the first three months of the year under review, the Department continued with its former staff consisting of the director, two clinical assistants, two nurses, and one clerk. By the end of June, 1931, the following staff members had been added: director of communicable disease control, general sanitation, and vital statistics; director of public health education and school health service; supervisor (a woman physician) of maternal and infant health service including midwifery work; supervising health visitor (public health nurse) in charge of the nursing service and the training of local health-visiting aides; one nutritionist; one sanitary inspector; one pharmacist; and four clerks.

New Health Center. As the present offices were wholly inadequate, a piece of ground was obtained in the neighborhood for the construction of a new health center which was completed in the fall of 1931. It includes a hospital of 25 beds to start with, an out-patient department, laboratories, classrooms, offices, and dormitories.

The building is one story and capable of future extension. The expense of construction was considerably reduced by the use of sun-dried mud bricks, of which most of the houses in Ting Hsien are built. It is heated by means of flues under the

cement floor. This "hot floor" system was used in the Chinese palaces and found to be very satisfactory. It gives more uniform heat and is cleaner than the open stoves and much less expensive than the modern heating systems. And too, it can be built by native workmen with native materials. Considerable attention has been paid to the design of the building so that it will be of some value as a model for other rural health workers and can be economically duplicated elsewhere.

Cost. The per capita cost of the health service was 56 cents Mexican (about 14 cents in United States currency). In addition, the sum of $43,000 Mexican (about $11,000) was allocated for the construction and equipment of the health center.

MEDICAL AND HEALTH SERVICES

Clinics and Dispensary Work. During the year, 535 clinics were conducted and 189 out-calls were made. In addition, the Department took charge of an antiopium infirmary. Altogether 4,248 patients were seen who made 14,916 visits, and 4,914 cases were treated, resulting in 17,411 medical services. This work was carried on through the following activities:

1. *City Health Clinic.* The health clinic in the City of Ting Hsien, opened on December 18, 1929, has been run regularly with service improving both qualitatively and quantitatively. A general clinic was held every morning for all cases. The daily attendance at the clinics ranged from twenty to forty. Maternal cases and patients requiring operative treatment were referred to the various special clinics, each conducted two afternoons a week.

2. *Niu-Tsun Village Health Clinic.* Since its inauguration on May 12, 1930, the clinic in Niu-Tsun village, about three miles from the City, has been conducted on Wednesday and Saturday mornings with an attendance of about twenty each time. The clinic serves also several other neighboring villages.

Since the health service is a demonstration and not a philanthropy, the people must take an active part in supporting it, or the work is not going to take root in the community. From the beginning, we were able to get the villagers to provide the building and furniture for the clinic. The patients were charged for the drugs and a charge of six coppers (less than two cents) was made for registration. Later we found that even this small cost prevented many from utilizing the clinic. Successful arrangements were made to have some of the expenses of the clinic paid from the public fund of the village so that no further charge was made against the individual patients. The activity of the clinic was thereby greatly increased.

3. *Kao-Tou Village Health Clinic.* Kao-Tou village is about three miles east of the City. The Mass Education Movement selected it for launching a special research on "mass education," of which health work constituted one of the essential elements. A health clinic was opened on May 1, 1931, and has been regularly conducted on Tuesday and Thursday mornings with an average attendance of about twenty patients. As at Niu-Tsun village, house, drugs, and furniture were provided from village funds and no charge was made against individual patients.

4. *Traveling Clinics.* Traveling clinics were carried on in the other villages during the winter months, when the farmers were not busy, with an average attendance of fifty-five. The function of the traveling clinic was not only to treat sickness but also to give practical instruction regarding the importance of preventive measures and to create an atmosphere favorable to health education.

The clinic touches practically all the important members of the community. Each clinic day was divided into three main periods. The morning was devoted to health classes for

young men and women, consisting of "Peoples' School" students and the literate members of the community. The afternoon was given over to the clinic which was open to everybody. The evening was spent in a health conference over a cup of tea with the village elders, teachers, and heads of families. At the end of the course, students in the health classes were given examinations, and seventy-two male students and twenty-five female students qualified. They were presented with certificates in the presence of the entire village community at graduation exercises celebrated in characteristic Chinese fashion, followed by a "social."

5. *Antiopium Infirmary*. A large number of persons in Ting Hsien use opium, which is detrimental to the finances as well as to the health and morale of the people. In an attempt to eradicate this menace from the community, an antiopium infirmary was opened on May 25, 1931, under a joint action of the county government, a committee of county elders, and the Health Department. The government and the elders were responsible for funds and for suppressing the sale of opium. The Health Department undertook the treatment of patients in the antiopium infirmary which has been taking care of about fifty patients ever since its opening.

6. *Out-calls*. During the year, 189 out-calls were made for eighty-five patients. One hundred and twenty conditions were treated, resulting in 210 medical services.

7. *School Health Service*. School health service was given in twenty-four Mass Education schools, or "Peoples' Schools," in twenty-four public primary schools, and in one kindergarten, with a total student population of 2,675.

The "Peoples' Schools" are schools for illiterate youths. Health classes were usually conducted in the winter evenings when the farmers were not busy. Instruction was given through textbooks, lectures, classes, demonstrations, et

cetera. The students of eleven of these schools had physical examinations and smallpox vaccinations.

In the preceding year, school health service had been given in only one public primary school and one kindergarten. The work encouraged the institution, this year, of similar service in twenty-three more schools with a total number of 1,955 students. The health service in these schools consisted of weekly health lessons, periodical examinations, correction of physical defects, preventive inoculations, control of communicable diseases, and sanitary supervisions. The school health service was divided into "A" and "B" grades. "A" grade school health service provided regular school clinics in charge of the physician. In schools with "B" grade service, where there was no regular clinic, a nurse visited the school twice a week, giving routine treatment of eye disease and skin troubles as prescribed by the physician. Some teachers were trained to give first-aid.

During this year, 589 smallpox vaccinations, 1,375 physical examinations, 790 Schick tests, 114 diphtheric toxin-antitoxin inoculations, 4,986 relief services, and 1,765 sanitary inspections were recorded. Health classes were held 789 times and "parent-teacher" conferences 125 times.

8. *Maternal, Infant, and Preschool Hygiene.* Maternal and infant health work included deliveries, maternal and well-baby clinics, and training and supervision of midwives. During this year, 157 antenatal and postnatal examinations, four deliveries, and eighty-nine infant health supervisions were made. More could have been accomplished had we been able to obtain a woman physician before March, 1931. For this type of work, a woman physician is indispensable in Chinese rural districts.

Since April, 1931, the Children's Health Club has been conducted regularly every Saturday by the nurses for teach-

ing preschool children wholesome health habits. The club met forty-three times this year with a total attendance of 637. Follow-up work was also carried out by the nursing staff.

9. *Nutrition Work.* Nutrition work was begun in March, 1931. Surveys were undertaken, nutrition classes were started. Goat milk and soy bean milk were introduced.

10. *Communicable Disease Control.* Cases of communicable diseases seen in the clinics and schools, or reported by the people, were investigated. Immunization service was given at the clinics and schools. Special smallpox vaccination clinics were conducted in villages and during temple fairs. Our sanitary inspectors and nurses rendered these services in the homes while they were carrying on their usual duties. Vaccination against smallpox was extended beyond the boundary of our health demonstration area. Thirteen vaccination stations were established in Peoples' Schools in different sections of the County. Altogether 11,543 persons were vaccinated during the year.

Summary of Medical Services Rendered

1. *Preventive Services:*	
Smallpox vaccinations	11,543
Schick tests	792
Toxin-antitoxin	155
Typhoid inoculations	44
Physical examinations	1,425
Sanitary inspections	1,765
Supervision of newborn	89
Deliveries and ante- and postnatal examinations	157
Other	9
Total	15,979
2. *Curative Services:*	
Dressings	7,462
Eye treatments	7,818
Prescriptions	2,103
Dental treatments	39
Operations	154
Other	3,707
Total	21,283
GRAND TOTAL	37,262

11. *Vital Statistics and Health Surveys.* Registration of births and deaths is not effectively enforced in Ting Hsien by the county government, but with the help of our students, "demonstration farmers," midwives, and others with whom we had contact through the

various activities of the Movement, the work turned out to be not so difficult as we had expected. The health demonstration area was again divided into five sections, and for each one a sanitary inspector was assigned for the investigation of births and deaths. In sections where the reports were believed to be nearly complete, the crude death and birth rates were 26.48 per cent and 29.43 per 1,000 respectively. In addition, several surveys of sanitary conditions and infant mortality were carried on during the past year.

12. *Nursing Service.* The staff of the nursing service consisted of one supervising nurse, one public health nurse, and one man nurse trained in clinical nursing. The student nurses helped to carry on the routine work as a part of their practical training. The nurses participated in all the health activities in the clinics, schools, and educational campaigns and in addition made 661 home visits.

Accompanying is a statistical summary of the medical services rendered during the year through clinics, schools, calls, and campaigns.

HEALTH EDUCATION

Among the various educational activities of the current year, the following deserve special mention.

School Health Meeting. After an examination of students on health questions in twenty-four public primary schools, a school health meeting was held on February 1, 1931, in the new auditorium which was attractively decorated with health charts, pictures, and posters for the occasion. About two thousand students, teachers, and parents attended. There was an exhibition of examination papers, and prizes contributed by friends and officials, including the magistrate, were awarded. This was for the encouragement of the student body as well as the promotion of interest among the officials.

Of the various features on the program, a four-act health play, both instructive and entertaining, produced by the nurses was most joyfully received. As a result of this meeting, a number of the school masters requested our assistance in their school health problems.

Training of Village Elders. In cooperation with the county government, a training course was made compulsory for all village elders and school teachers of the County. Three courses were given in succession, each lasting a period of three weeks. Health was one of the major topics.

Health education work in Ting Hsien, China, prior to July 1, 1931

Educational:	
Health lectures	319
Health classes	789
Health conferences	125
Health talks	2,518
Health clubs	43
Health campaigns	3
Health dramas	5
Total number of persons attending the above meetings	*244,739*
Other:	
Posters and pamphlets distributed	3,850
Newspaper articles	50
Health textbooks prepared	3
Health training courses	4

Mass Education Institute for Governmental Delegates. Twenty-six governmental delegates were sent from Nanking and Mukden to study the work in Ting Hsien with the purpose of starting similar work elsewhere. The course lasted about four weeks and all the departments took part in the training.

Health Class for Christian Workers. Upon the request of the churches in Popei and Shansi provinces, a rural health class was held from May 11 to 17, 1931, for sixty-five evangelists.

Health Course for Rural Workers. A short course on health was given to the students in the Normal School for Mass Education Teachers and twenty-six rural workers from Honan province.

The health educational work is statistically summarized in the accompanying table.

TRAINING OF FIELD HEALTH WORKERS

The local training of subordinate field workers is thought to be of great importance for several reasons. One is the scarcity of personnel trained in health work in China; a second reason is the high cost of maintaining a sufficient force of public health workers trained abroad or in the few medical institutions in China. A third is the desirability of using local persons who speak the local dialect, who are acquainted with local conditions and are "unspoiled," as it were, for village life, for, it is highly improbable, even if an adequate personnel from other sources could be supported locally, that enough would be contented to live and work in the rural districts. As there is already indication of a growing interest in rural health, it is very important to determine the method of training as well as the type of personnel to be trained.

Eventually the health personnel to be trained will be selected from the Training Institute of the Mass Education Movement, men and women who have learned the general principles and technique of mass education and are interested in public health work. For the immediate future we have started the training of health visitors (nurses), sanitary inspectors, and midwives. The general principles of mass education are given in addition to specific health training.

Health Visitors. A three-year training course was opened on September 15, 1931, for five boys and nine girls, graduates of the middle school. They are being taught both clinical and public health nursing. Considerable emphasis is placed on the fact that the course must meet actual rural needs rather than adhere slavishly to professional standards elsewhere.

Sanitary Inspectors. A training course for sanitary inspect-

ors was opened on October 17, 1931. The students were recruited from middle school graduates. The course is six months, the first four months devoted to class work and the last two months to field practice.

Midwives. It is one of our health projects to reduce tetanus neonatorum and puerperal infection by introducing aseptic midwifery service. One important step in tackling this problem is to provide the people with a sufficient number of trained midwives. Two methods of training this type of personnel can be developed experimentally: (1) training of women in the villages by simple instruction and procedures that at least may prevent tetanus and other infections; and (2) training of women for six months or longer to qualify as better-type midwives and to be responsible for some of the prenatal and postnatal work and for following-up babies through the first year of life.

With the addition of a woman physician to the staff in March, 1931, we were enabled to make a start on the fifteenth of the month. Two classes have been trained since then. The students consisted of elderly women who had been called upon most frequently to act as midwives. They have studied in our Peoples' Schools if they were illiterate at the time of beginning their training.

The curriculum consisted of fifteen lessons in simple midwifery technique and the successful management of five deliveries. The course usually took about a month.

NEWS DIGEST

●●● *Cattaraugus County After the Health Demonstration*

If one were to consider the progress reports of all the demonstrations that have been conducted in the United States, he probably would agree that the most important year of the enterprise is the first year after the demonstration is over. Obviously 1931 is an important test of the Cattaraugus County Health Demonstration's effectiveness.

This demonstration is perhaps unique in the continuity of support that has been afforded to the objects of the demonstration over a period of eight years —that is, three full years after the original five-year demonstration period was ended. This persistence has conveyed to many minds a proof of the reality of the demonstration objectives. The continuation, therefore, of health work stimulated by the demonstration in Cattaraugus County is significant.

At the end of the eight-year period, public authorities in Cattaraugus County assumed the support for practically all of the demonstration enterprises. The County Board of Supervisors appropriated $87,000 for the Department of Health in 1931. To this total may be added the appropriations from official funds to carry the social workers now attached to the County Department of Welfare. Summarizing the appropriations for 1931 on the basis of Dr. C.-E. A. Winslow's studies, it is apparent that $178,000 was available for health work of all forms in Cattaraugus County during 1931, this sum being entirely exclusive of any aid received for special projects from the Milbank Memorial Fund, but including the Department of Health, laboratory, local school, and local health activities, as well as local nursing groups and the maintenance of the county sanatorium for tuberculosis. Of this total of $178,000, $43,500

was returned in the form of State aid, leaving a net expense to agencies within Cattaraugus County of $134,500, a very substantial sum and equivalent to a total of $1.85 per capita. It may be questioned whether any rural area has appropriated from its own funds a per capita amount as large as this.

However favorable this financial accounting may appear, it would be unfortunate if the effect of the demonstration should be measured entirely in terms of the action of appropriating bodies. The basic effect on public opinion has been an exceedingly powerful influence, but is, of course, less tangible than the effect just mentioned. The cooperative spirit of various groups, including physicians, welfare agencies, private individuals, and voluntary organizations, has been splendid during the year 1931, and the generosity of the commitments for 1932 in the face of the depression may be traced directly to this widespread public support.

The level of service in public health nursing, in communicable disease control, in tuberculosis clinics, in sanitation, and in the laboratory has been maintained or definitely increased as compared with the last year of the demonstration. Clinical service for venereal diseases has been significantly increased. A series of investigative projects has been supported through the generosity of the Milbank Memorial Fund, thus taking advantage of the opportunities provided by the existing health work for studies in the various aspects of public health administration. Dr. Winslow's volume, "Health on the Farm and in the Village," published during the year by The Macmillan Company, points out the splendid opportunities for investigative projects in the fields of maternal, infant, and child hygiene, in the control of syphilis, and the education in health of rural school children. It is gratifying that opportunities have presented themselves this year to begin the work in all three projects. A new director for the Bureau of Maternal, Infant and Child Hygiene has been secured and definite work resumed in this field. A director for the health education study has been secured and a field investigation of the epidemiology of syphilis has been undertaken by the Deputy Commissioner of Health.

There has been continued the very interesting family study of

tuberculosis carried out intensively in the Ellicottville area in coordination with the tuberculosis clinic services and the morbidity study in this same district. The past year has shown a continuation of the very favorable tuberculosis mortality experience, some features of which are much clearer in the light of these special studies. A laboratory study of rural water supplies carried out as a project has already yielded valuable results, and a field study in the epidemiology of whooping cough has taken advantage of the special opportunities for the study of human contact to be found only in sparsely settled districts. It is especially gratifying to note that the School Hygiene District, a demonstration agency supported by the Milbank Memorial Fund in order to bridge the gap between the responsibilities of the educational authorities and the health authorities in the schools, has now been taken over as a routine service to be supported entirely during 1932 by county and state funds.

It is indeed a test of the integrity of any department of health to be able to carry out so diverse a program of projects in a year next following the close of the demonstration, but the people of Cattaraugus County have responded splendidly in appreciation of the opportunity which is theirs to aid in scientific investigation. This can be shown by the willingness of some 1,200 families representing nearly all the households in the special study area who have faithfully recorded their illnesses over a period of two years. The fruits of this study are beginning to be felt in new methods for evaluating the administrative aspects of the work.

The year 1931 in Cattaraugus County has seen not only the taking over of routine services on a generous basis by public authorities and the establishment of numerous investigative projects, but it has seen real progress in the field of integration between the health and welfare authorities. This has been singularly promoted by the gift of the Bartlett Memorial Community Center in Olean, in which there are now located the offices of practically all of the health and welfare agencies in the County. This includes the offices of the County Departments of Health and Welfare, with the social service staff and district health station, together with the Catholic Charities, the American Red Cross, the Com-

munity Chest, the executive offices of the Boy Scouts and Camp Fire Girls, the headquarters for old age relief and the School Hygiene District. The staff in Cattaraugus County will bear testimony to the value of propinquity in helping solve the numerous difficult problems which arise in such an area during the developmental stage, and especially while organized facilities are still young.

⊛ ⊛ ⊛ *Tuberculous Infection Among Rural School Children*

AN extremely low incidence of tuberculous infection among children of school age in the more rural parts of Cattaraugus County, New York, has been revealed by a careful tuberculin survey, according to an article by John H. Korns, M.D., which was published in the November, 1931, issue of *The American Review of Tuberculosis*. The tuberculin survey is a part of a special study of the epidemiology of tuberculosis which was started December, 1929, in Cattaraugus County by the Division of Research of the Milbank Memorial Fund, in cooperation with the Cattaraugus County Health Department.

For the study of the prevalence of tuberculous infection among children, a portion of the County was chosen which was essentially rural in character. The tuberculin tests were given to children from five to nineteen years of age in eighty-five schools in eighteen townships. Thirteen of the eighty-five schools were in villages, none of which had a population of more than 1,308, and seventy-two were one or two-room rural schools.

Intracutaneous tests of a standard dosage of .01, 0.1, and 1.0 mgms. of Old Tuberculin (human) were given to 1,103 of the 3,238 children enrolled in the village and rural schools. The only factor of selection was the consent of the parents to have the test made, and the children tested appear to be a random sample of the rural school population. Slightly more than 12 per cent of the 650 children tested in the village schools and 6.6 per cent of the 453 tested in the rural schools had a positive reaction. Careful inquiry was made regarding previous residence of those tested and a much higher incidence of tuberculous infection was found for all age groups (21.1 per cent) among children who at some time had lived (largely, but not exclusively in cities) outside the

County as compared with 7.6 per cent positive among the children who had lived within the County since birth.

With reference to the astonishingly low tuberculous infection rate among life-time resident school children in the rural parts of Cattaraugus County, Dr. Korns points out:

1. A well-organized Bureau of Tuberculosis has been operating in the County since 1923, stressing the importance of early diagnosis and the segregation of open cases.

2. For a similar period, tuberculin testing of cattle has been in vogue within the County, with the result that in 1928 less than 0.5 per cent of the cattle were reactors.

The incidence of tuberculous infection among children of school age in the more rural parts of Cattaraugus County was lower than that found by Dr. Walter L. Rathbun in a relatively comparable group of rural school children in Chautauqua, an adjoining county.

• • • *The Accuracy of Official Tuberculosis Death Rates*

SOME of the limitations in the use of officially recorded statistics of death from tuberculosis in a political unit of area, Cattaraugus County, New York, have been emphasized in an article, "The Accuracy of Official Tuberculosis Death Rates," by Jean Downes of the staff of the Fund's Division of Research, which appears in the December, 1931, issue of the *Journal of the American Statistical Association*. This particular study was made in the belief that a more precise knowledge of the nature and of the quantitative effects of the limitations upon a specific death rate, even in a sample area, will not only contribute to a better understanding of mortality records as data but also may suggest bases for improvement.

The study revealed the necessity for taking into account the following conditions as affecting the tuberculosis mortality rate in recent years.

1. *Completeness of death registration.* The presence of 1,000 Indians living on reservations within the County, among whom registration of deaths has been very incomplete until recent years, necessitated their exclusion in studying the mortality over a period of years.

2. *Residence of decedents.* The necessity of correcting the recorded data for residence of decedents in this particular area,

with a sanatorium for a specific group of nonresidents within its boundaries, was found to be of particular importance since the nonresident deaths affected both the trend of mortality and the death rates specific for age.

3. *Procedure in classifying deaths according to cause where more than one cause is stated on the death certificate.* The arbitrary classification of deaths as due to tuberculosis when that disease is noted only as a secondary cause of death, rather than acceptance of the physician's statement as to the actual cause of death, tends to vitiate official tuberculosis statistics. Tuberculosis as a secondary cause of death was found to operate increasingly with age.

4. *Diagnosis of cause of death.* The further correction of the tuberculosis mortality by the exclusion of deaths where the diagnosis of tuberculosis was considered "doubtful" or "erroneous," according to the socio-medical histories presented a different, and probably more correct picture, of the actual mortality from tuberculosis in Cattaraugus County.

The effects of these corrections upon the crude rate, for the period of 1928-1930, may be summarized as follows: average annual rate based on officially recorded deaths, 67.9; excluding Indians, 64.7; excluding Indians and Buffalo sanatorium deaths, 43.8; excluding Indians, Buffalo sanatorium deaths, and deaths not certified as primarily due to tuberculosis, 39.7; a further correction by excluding deaths which in the light of additional socio-medical evidence were not primarily due to tuberculosis, 33.2.

● ● ● *"Health on the Farm and in the Village" is Reviewed*

THE increased attention to public health movements in rural communities of the United States, as well as the growing conviction that the county health unit must eventually replace the local boards of health, are revealed in the extended comments by the press on Dr. C.-E. A. Winslow's "Health on the Farm and in the Village," the report on the Cattaraugus County Health Demonstration, which was published last May. The *American Journal of Public Health* finds in this volume "a good summary of the outstanding lessons of the demonstration" and says that "from its nature it should be of interest to public health men and to prac-

tical social service workers in rural communities. The book is written from an optimistic point of view, and the author's economics used in computing returns on the investment in public health are orthodox, even if questionable. For anyone contemplating an attempt to organize a county health program, this book will offer quite valuable guidance, giving as it does, details of organization and describing machinery for a fairly successful attempt as well as pointing probable obstacles."

The *Medical Journal and Record* also finds the book "an interesting and valuable report of the experiences of a typical rural county in developing public health protection for a rural population." *The Survey*, citing a short article about rural health written by Dr. Winslow some months ago for that magazine, continues: "Here is the whole story, an impartial and comprehensive survey by an expert in public health organization, giving not only the record of what actually happened in Cattaraugus County, but also suggestions in information and advice for health workers in other rural areas. *Survey* readers who saw Professor Winslow's article will not need to be told that the volume is invaluable as a forceful and luminous account of problems, experiences, solutions, and ideas. Illustrations by photograph and chart and an excellent index add to the book's attractiveness and usefulness."

"This report is interesting to all engaged in public health work and especially to those concerned with the problems of rural health," says *Public Health Nursing*. "Quite without bias the successful and the less successful steps in the development of this program are related. The evaluation of the services is decidedly objective."

Foreign medical publications, too, notably British, have given extended space to a discussion of Dr. Winslow's report. The *Medical Officer* of London, after describing the purpose and procedure of the Cattaraugus County Health Demonstration, comments as follows: "To an English reader, accustomed as he will be to fully developed and highly organized county and urban health services, it will come as somewhat of a surprise that it has been necessary to supply liberal grants from a voluntary organization in order to secure something of a similar organization in New York State. The description by Professor Wins-

low of the organization of tuberculosis control, a school health service, a county nursing service, a scheme for the treatment of cripples, laboratories, and other activities of a similar character, is full of interest, and will, we doubt not, act as a real stimulus to public opinion in the United States. The Milbank Memorial Fund is to be congratulated on the general results already achieved."

The British Journal of Tuberculosis devotes a column and a half to a detailed presentation of the Cattaraugus County Health Demonstration and makes many interesting comparisons between public health administration in Great Britain and the United States. In this connection, the reviewer says of Dr. Winslow's study: "In this country there has been a much greater uniformity of public health progress than over the water, and it is correspondingly more difficult to decide how much of our improvement in health is due to *ad hoc* administrative effort. The carefully studied experiences of Cattaraugus County are therefore of great interest, and Professor Winslow's conclusions ought to hearten our sanitary authorities and their officers. It will possibly comfort the older school of British sanitarians to read in an American publication that 'experience in Cattaraugus County has shown that sanitation cannot wisely be minimized in a county health program.'"

• • • *The Diphtheria Prevention Commission Report*

THE saving of the lives of 1,400 children in New York City by the timely use of toxin-antitoxin, and the prevention of 17,000 diphtheria cases, are credited to the three years' intensive campaign conducted in the metropolitan area by the Diphtheria Prevention Commission, in its final report issued last November. This body was appointed in November, 1928, by Dr. Shirley W. Wynne, Commissioner of Health of the City of New York, to carry on an educational program leading to a more general use of toxin-antitoxin. At a total cost of $140,000 a year, or two cents per capita population, according to the report, results were achieved in accomplishing this purpose which are felt to be highly satisfactory, although continued effort through regular official agencies will be necessary. The cost of the campaign was shared by the Department

of Health, which appropriated $70,000 a year for the work of the Commission, and the Milbank Memorial Fund which participated to the extent of $75,000 in 1929, $65,000 in 1930, and $50,000 in 1931, or a total of $190,000. Contributions from the Metropolitan Life Insurance Company further augmented the resources of the Commission.

In the three years the Diphtheria Prevention Commission functioned, the report states, the number of diphtheria cases in one metropolitan area decreased by about 56 per cent, and the death rate from diphtheria by 80 per cent from the average figures of the ten years immediately preceding the campaign. When the Commission began its activities on January 1, 1929, the report further states, the average number of cases of diphtheria for the previous twenty-year period was more than 10,000 per year, while the deaths averaged about 1,000.

The Commission was originally designed to be merely a demonstration "of what could be accomplished by a cooperative and well-financed effort," Commissioner Wynne declares. It was first made possible, he points out, when the late Dr. Lee K. Frankel of the Metropolitan Life Insurance Company volunteered financial support for the undertaking, suggesting Edward Fisher Brown as director of the campaign. The enlarged program later evolved was made possible with grants from the Milbank Memorial Fund.

In the course of the demonstration more than 512,000 children received the toxin-antitoxin treatments, either from their family doctors as a result of the educational work of the Commission's workers, or at the Department of Health baby stations. The whole campaign was conducted almost solely on educational lines. Hundreds of articles supplied by the Commission's publicity staff were printed in the English and foreign language press. The message of toxin-antitoxin was broadcast in many tongues over the radio, through the cooperation of broadcasting companies which gave free time to the Commission's speakers. Talking pictures, too, carried the propaganda to added thousands, while literature of many kinds reached countless homes. From the pulpit of almost every house of worship in the City the same message was delivered by clergy of many denominations. Physicians and nurses in traveling

clinics carried toxin-antitoxin into congested districts and to shore resorts, as well as to remote rural sections. On crowded thoroughfares, electric signs and vast billboards bore a challenge to parents to safeguard their children from the menace of diphtheria. Social and welfare societies, nurses' associations, and other professional groups sponsored meetings and conferences arranged by the Commission for mothers, while chambers of commerce, boards of trade, and other civic organizations contributed speakers to aid in the battle against diphtheria. Transit lines gave free space for cards urging parents to have their children immunized.

"The record established by the Commission," said Commissioner Wynne, "will always stand out as one of the great achievements in public health work in this City, and one of the most successful demonstrations of what can be accomplished by well-planned efforts."

● ● ● *Comments About the Sir Arthur Newsholme Studies*

SIMILARITY in the public health problems confronting the European countries studied by Sir Arthur Newsholme becomes increasingly apparent with the publication, dealing with Great Britain and Ireland, of Volume III of his "International Studies on the Relation Between the Private and Official Practice of Medicine" (Allen and Unwin, London; and Williams and Wilkins, Baltimore). Upon publication of one of its predecessors, the Birmingham (England) *Post* made this observation. The *Red Cross Courier* also commented on "the remarkable parallelism in the medical problems facing each country, problems akin to those that prevail in the United States, which have led to the formation for their study of the Committee on the Costs of Medical Care." Dr. Kendall Emerson, writing in the *Child Health Bulletin*, notes that "while Sir Arthur finds marked diversity of method in the various countries, he brings to light a definitely accepted principle of state responsibility, which appears common to them all." Dr. Emerson expresses the judgment that "a careful scrutiny of these works should be a part of the equipment of all who are interesting themselves in the philosophy and economics of a government's responsibility for the health of its people."

The *Journal of the American Medical Association* analyzes the purpose of these studies as, among others, that of "utilizing methods not unfriendly to the interest of the medical profession, and of discovering how the services of the private physician may best be utilized in public health." *Hygeia*, nevertheless, notes that "in every country the question of the relationship of private medical practice to organized community control of medical care was a snag in the situation." *Hygeia* feels, however, that these studies afford "a better picture of general conditions in the field of social medicine than has heretofore been available in any other place."

Dr. C.-E. A. Winslow, writing in the *American Journal of Public Health*, says, "We are beginning at last in this country to emerge from adolescent self-satisfaction and to recognize that older nations have much to teach us, particularly in the field of social organization. We could have no better instructor than Sir Arthur Newsholme." Of Volume I, he says, "It is accurate, dispassionate, and well balanced. It should be invaluable to all thoughtful students of this problem as opening up new vistas of international experience in a most important field."

● ● ● *Fellows Appointed for Postgraduate Research Study*

SINCE 1929 two research fellowships have been provided annually by the Milbank Memorial Fund in the fields of public health, population problems, health education, and social welfare and relief. The object of these fellowships is to afford an opportunity to postgraduate students for further formal training or for specific research projects, or both, in these fields. The recipients of these fellowships have been as follows, the courses pursued or projects engaged in during fellowship incumbency being shown in italics:

1929-1930: George A. Baker (Ph.D., University of Illinois): *statistics* and *public health* at Columbia University.

1929-1930-1931: Elliott H. Pennell (A.B., Bowdoin College): *statistics*, *epidemiology*, and *public health* at Columbia and Johns Hopkins Universities.

1930-1931: Katharine Berry (A.B., West Virginia Wesleyan College): *sociology* at Columbia University (M.A., 1931).

1931-1932: Hsun-Yuan Yao (M.D., Peking Union Medical College): *public health administration* at Johns Hopkins University.

1931-1932: Clyde V. Kiser (A.B., M.A., University of North Carolina): *research in population problems*, Milbank Memorial Fund.